



Operation and Maintenance Manual

Project Name: Plant 1 PS Screens

Project Location: Wichita, KS

Vulcan Multi-Rake Screens, Shaftless Screw Conveyors
& Washing Presses
Model No. VMR-48, TF-240 & EWP 300/600

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Vulcan Job No. 19177

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Section 1 General Safety Instructions

1 General Safety Instructions

1.1 Operator's Responsibilities

This machine was designed and built to operate within all applicable safety guidelines. In practice, however, this safety can only be achieved if all the necessary measures are taken. It is the responsibility of the owner and/or operator to ensure that these measures are taken and to monitor their performance.

The operator must ensure the following:

- The machine is used only as directed in this manual.
- The machine is in good working condition and the safety devices are checked regularly for their operability.
- The required personal safety gear for operating, maintenance and repair is available and is used.
- The operating instructions are available in legible condition and in complete form.
- Only adequately qualified and authorized personnel operate, maintain and repair the machine.
- All the safety and warning signs attached to the machine are in place and remain legible.
- All doors, panels, covers, and guards are closed or secured in place.

1.2 Safety Measures

A. Keep Information Available

Keep these operating instructions in an easily accessible location. Ensure that everyone working on the machine can access the operating instructions at all times.

Keep all safety signs and instruction plates on the machine in legible condition. Immediately replace signs that have become damaged or unreadable.

B. Biohazardous Materials

When operating the machine, especially when performing maintenance and upkeep, it is imperative that you comply with applicable instructions and guidelines on safety, occupational medicine and hygiene. The medium processed by the machine falls under the category of:

“Biologically Hazardous Material”!



Section 1 General Safety Instructions

C. **Before Turning the Machine on**, familiarize yourself with the following:

- The operating and control elements of the machine.
- Machine equipment.
- The mode of operation of the machine.
- The immediate surroundings of the machine.
- The safety devices on the machine.
- Emergency measures.

Before the machine is turned on, perform the following:

- Check and ensure that all safety devices are attached and functioning.
- Check the machine for visible damage. Immediately rectify defects or report them to supervising personnel. Operate the machine only when it is in good working condition.
- Ensure that only authorized personnel remain in the area of the machine and no one might be injured when the machine is activated.



Caution: Automatic Equipment! When the machine is activated it can run in automatic mode, and can start automatically at any time.

D. **During Normal Operation**

Do not remove or deactivate any safety device while the machine is running.

Do not operate the machine with guards, doors, panels or covers removed.

E. **During Maintenance**

Perform the maintenance work prescribed in the operating instructions – adjustment, cleaning, lubrication, upkeep and inspection – within the suggested maintenance schedule.

Take note of special requirements for individual components in these operating instructions.

Before performing maintenance work:

- Disconnect the power supply. Follow all Lock-Out Tag-Out procedures in place for the worksite. Note that control panels may have more than one source of power.
- Ensure that all parts of the drive have cooled down to room temperature.
- Ensure that appropriate hoisting gear and load suspension devices are available when large machine parts have to be replaced.
- Bar access to the work area of the machine and ensure that no unauthorized people remain in it.
- Replace machine parts that are not in good working condition
- Use only genuine replacement parts from the manufacturer.
- Ensure that suitable collection containers are available for all substances that are hazardous to groundwater (oils, coolants, etc.).



Section 1 General Safety Instructions

After maintenance work is completed and before switching on the machine:

- Check that all bolted joints previously loosened are securely fastened.
- Check whether all safeguards and covers previously removed are properly installed.
- Ensure that all tools, materials, and other equipment used have been removed from the work area.
- Clean the work area and remove liquids that might have spilled.
- Ensure that all safety devices of the machine are functioning properly.

F. Working on Electrical Equipment

Only trained electricians should perform work on electrical equipment of the machine.

Regularly check electrical equipment:

- Reattach loose connections.
- Immediately replace damaged wires or cables.

Always keep the control panel and all electrical supply units closed. Access is allowed only by authorized personnel.

Never clean electrical equipment with water or similar liquids.

G. Environmental Protection

When performing work on the machine, follow the protocol for waste prevention and proper recycling or waste disposal.

Ensure that hazardous substances such as grease, oils, coolants, solvent-containing cleaning fluids, etc. are collected and disposed of in a safe manor and as prescribed by environmental laws.

H. Equipment Modifications

For safety reasons do not perform any unauthorized modifications to the machine. This also applies to welding work on load-bearing parts.

Vulcan Industries, Inc. must approve all modifications in writing.

Use only genuine replacement parts from the manufacturer. Parts manufactured from a third-party do not conform to the manufacturers design standards.

The use of third-party parts and special equipment on the machine could result in catastrophic failures and void the warranty.



Section 1 General Safety Instructions

1.3 Requirements for Operating Personnel



Warning: All operating and maintenance personnel must read and understand these operating instructions before operating and/or performing maintenance to this machine.

A. Operating Personnel

Only personnel who are trained, instructed, and authorized to operate the machine may do so. These personnel must be familiar with the operating instructions.

The following qualifications are needed for the following activities:

- Only electricians may perform work on electrical equipment.
- Only trained personnel may perform maintenance, upkeep, and repair work.

1.4 Other Dangers

A. Risk of Injury

Do not impede the operating sequence of the machine. Injury from the moving components can occur. Lock-out the machine before performing any kind of inspection or maintenance activities.



Warning: Do not reach into automatic equipment without first shutting down the machine! The machinery can start at any time.

B. Build-up of Hazardous Gasses

Because of the nature of the treatment process, hazardous gasses may form and lead to a deadly atmosphere. Always take appropriate precautions when operating and/or maintaining equipment in a classified area.



Warning: There is risk of explosion or detonation.



Section 1 General Safety Instructions

1.5 Safety Symbols

The following are pictures and explanations of all the safety stickers that are used on Vulcan equipment. Some of these may or may not pertain to your particular machine.



A spreader bar must be used when lifting this machine.



Contractor, make sure the seal off fitting is potted before you close out the job.



Be careful of moving parts when working on the machine. Use proper Lock-out procedures.



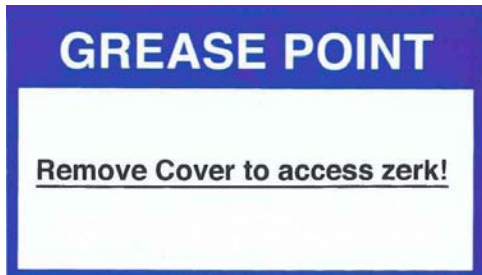
This part of the machine is not meant to be used as a step. Injury to persons or damage to machinery can result.



Section 1 General Safety Instructions



Grease point for maintenance reference.



Grease point for maintenance reference.



Watch for an open pit.



Equipment in Automatic mode may start if sensors are triggered. Make sure the machine is properly locked-out



Section 1 General Safety Instructions



Do not operate the machine with covers removed.



Take care in not getting caught in the exposed screw or other moving parts.



Section 2 Receiving, Storage & Transporting

2 Receiving, Storage & Transporting

2.1 Receiving

A. Suggested Receiving Practices

Upon receipt of the equipment, locate the packing slip and verify completeness of the shipment. The packing list will clearly indicate the items that have shipped, contents of containers and component weights. Contact Vulcan Industries, Inc. immediately if the received items are not as indicated on the packing slip.

No claims for missing components will be honored if not identified at the time of receipt of the shipment.

Upon receipt of the shipment, carefully check the contents of the delivery against the packing list to insure that the delivery is complete, and all components are accounted for.

Components are generally shipped on skids or pallets though occasionally they are shipped loose inside the equipment. Do not remove the equipment from the shipping skids or pallets, except as required to inspect the components, and check the scope of supply. Inventory all loose items identified on the packing list.

The skids must be placed on a smooth, level surface. When stored outside, suitable cribbing must be arranged to support the skids and their associated weight.

Care must be taken when unloading the equipment from the carrier. Prior to attempting to off-load the equipment:

- Inspect lifting points, rigging, and equipment.
- Confirm lifting capacities for all rigging and equipment.

Before unloading and accepting any equipment from the shipping company, thoroughly inspect the equipment and/or packaging for signs of damage. If damage to the packaging is discovered, immediately check the contents for damage.

If visual damage is evident, do not accept delivery until directed to do so by an authorized Vulcan Industries, Inc. representative.

Warranties are only valid if equipment is delivered and stored without damage.

2.2 Storage

A. Short Term Storage

The equipment, if possible, should be stored inside in a climate controlled environment.

The major pieces of equipment are shipped on skids or pallets. Do not remove the equipment from the shipping skids or pallets, except as required to inspect the components, and check the scope of supply.



Section 2 Receiving, Storage & Transporting

The skids must be placed on a smooth, level surface. If stored outside, a suitable cribbing must be arranged to support the skids and their associated weight.

The equipment should be covered with a tarp to protect it from moisture, dust, or other harmful elements.

B. Long Term Storage

If the equipment is to be stored outside for more than one month, the following “lay up” procedures must be followed:

- Drain gear cases completely, and refill completely full with a compatible gear oil. Lubrication recommendations may be found in Section 5 of the Operation and Maintenance manual. The gear is normally shipped with a plug installed in the breather port. Make sure the plug is installed and not the breather. Tag the gear “Check oil level before operating”.
- Coat the chains and sprockets with a heavy duty Penetrant/Demoisturant/Rust Preventative (alphasourceintl.com) product number S00710 or equal.
- After lay- up and before installing the equipment, the following procedures must be followed:
 - Unbag all electrical components and inspect for corrosion.
 - Use a suitable solvent to remove all protectant from chains, sprockets, etc.
 - The equipment should be washed down completely and thoroughly dried. Inspect for any signs of corrosion.
 - Drain the gear cases down to the normal fill level. (Note: Some equipment may need to be installed prior to performing this step).
 - Follow all lubrication instructions as outlined in Section 5 of the Operation and Maintenance manual.

Follow the normal installation procedures as outlined in Section 3 of the Operation and Maintenance manual.

Figure 2.2 below is the preferred method of storing the machine.



Section 2 Receiving, Storage & Transporting

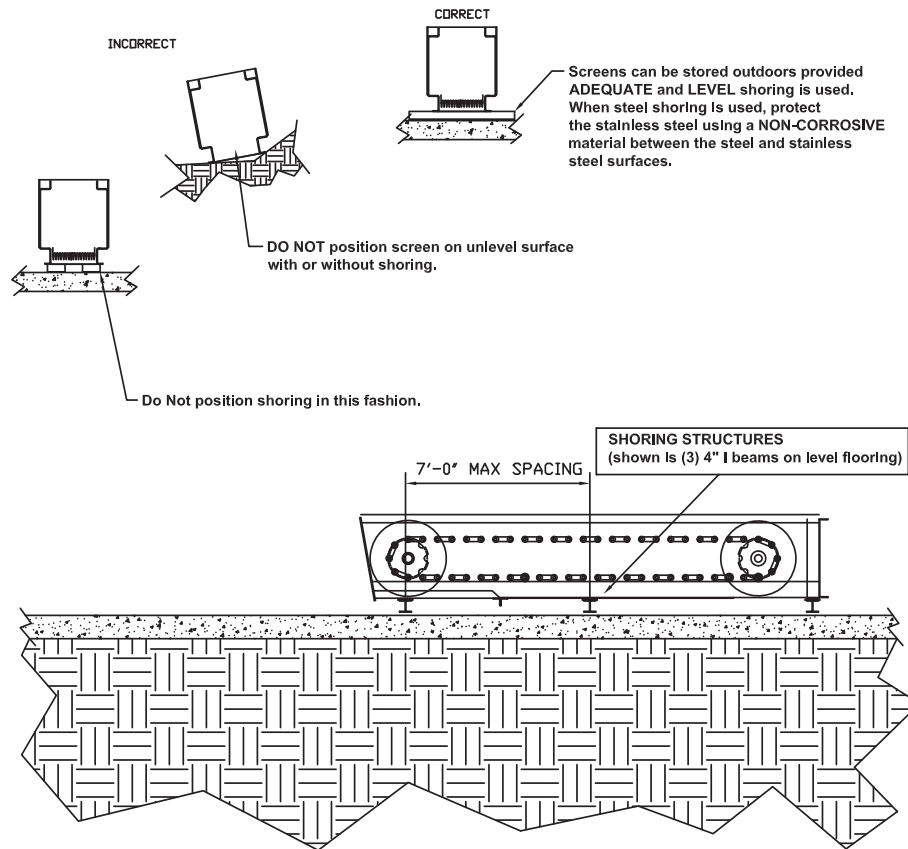


Figure 2.2



Section 2 Receiving, Storage & Transporting

2.3 Transporting the Equipment

A. Safety Precautions for Transportation

When transporting the machine, the following precautions must be taken into account:

- Protruding edges may lead to cuts.
- Suspended loads may fall, causing mortal danger.



Caution: Never stand under suspended loads!

- Parts that have been stacked too high may fall.
- Using load suspension devices other than those indicated here could severely damage the machine.

B. Ground Transportation

Transport the machine only in the original packaging, and using suitable ground transportation designed for the load and size of the machine. Refer to the packing slip for actual shipping weights of the equipment.

Do not place any objects on the machine while it is being transported.

During transport protect the machine against:

- Overturning.
- Violent action from the outside.
- Mechanical jolts and vibrations.
- Humidity.
- Effects of heat.

C. Suspended Transportation

Transport the machine only in the original packaging using suitable hoisting equipment designed for the load and size of the machine. Refer to the packing slip for actual shipping weights of the equipment.

The use of lifting trucks / forklifts to maneuver screens being stored indoors is acceptable. Use caution when lifting and turning. Attempting to turn the screen at sharp angles can damage the screen.



The use of chokers and slings is strictly prohibited!

When lifting lugs / devices are not used, a spreader bar positioned over the component as shown in Figure 2.3 is required. The strap / cable must not create a squeezing effect on the equipment being raised.

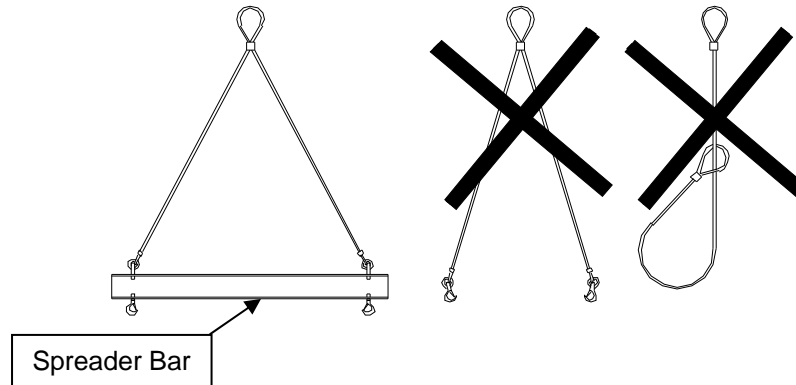


Fig. 2.3



Section 3 Installation & Start-up

3 Installation & Start-up

3.1 Pre-Installation Instructions

Experienced personnel trained in the installation and operation of this type of equipment must be employed to perform the installation of this equipment. Any questions regarding the installation should be directed to Vulcan Industries, Inc.'s, Installation and Service department. The following steps must be performed in order:

- Check the channel
- Inspect and identify components
- Machine placement
- Fitting the channel side seals
- Mounting the gearbox housing vent
- Transition to post-screening equipment
- Start-up

A. Standard Erecting Practices

All fabricated equipment manufactured by Vulcan Industries, Inc. is shop assembled and tested prior to shipping and should not present any abnormal erection problems. Due to varying field conditions, a reasonable amount of fit-up is considered standard erection practice. The use of such tools as “come-a-longs”, jacks, drifts, and reamers is to be expected. The equipment should be assembled and installed according to the AISC “Code of Standard Practice”. Section 7.12 of that code states:

“Normal erection operations include the correction of minor misfits by moderate amounts of reaming, chipping, welding, or cutting, and the drawing of elements into line through the use of drift pins. Errors which cannot be corrected by the foregoing means or which require major changes in member configuration are reported immediately to the owner and fabricator by the erector, to enable whoever is responsible either to correct the error or to approve the most efficient and economic means of correction to be used by others.”

If an erection problem is traceable to Vulcan Industries, Inc.'s, Fabrication or Engineering departments, we will work to resolve the problem. If field modifications are done by others to correct the problem, they must be approved in writing by Vulcan Industries, Inc. No back charges will be accepted by Vulcan Industries, Inc. unless the deficiencies are documented and the remedy is approved in writing by Vulcan Industries, Inc.

B. “As Built” Drawings

Vulcan Industries, Inc. provides detailed “AS-BUILT” installation drawings. Drawings should be thoroughly reviewed prior to installing any Vulcan equipment.



IMPORTANT! Always verify the detailed drawing is marked “AS-BUILT”. Drawings not marked “AS-BUILT” may not reflect contract

changes to the approved shop drawings required during manufacturing and therefore may be incorrect.

3.2 Check the Channel

- After locating the channel center, use a plumb bob to measure the wall plumb in relation to the string as shown. Measurements should be equal.
- The channel width if slightly wide is not a problem. However, the **channel cannot be narrow.**
- Verify the channel floor is free of debris and is level. The area where the screens frames will sit should be leveled. (When required, Vulcan Industries, Inc. recommends using stainless shims and a transit).

Figure 3.2 shows proper channel configuration.

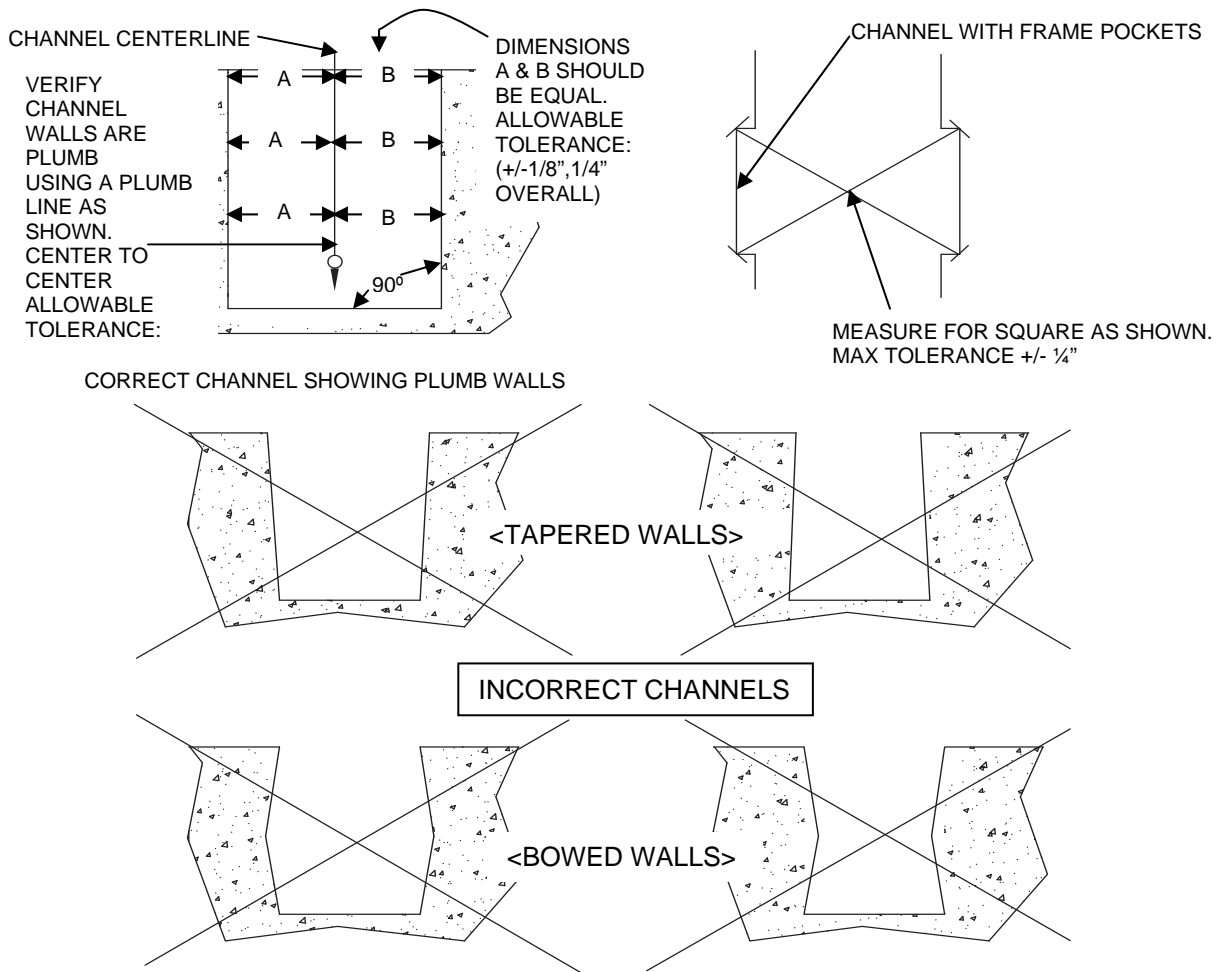
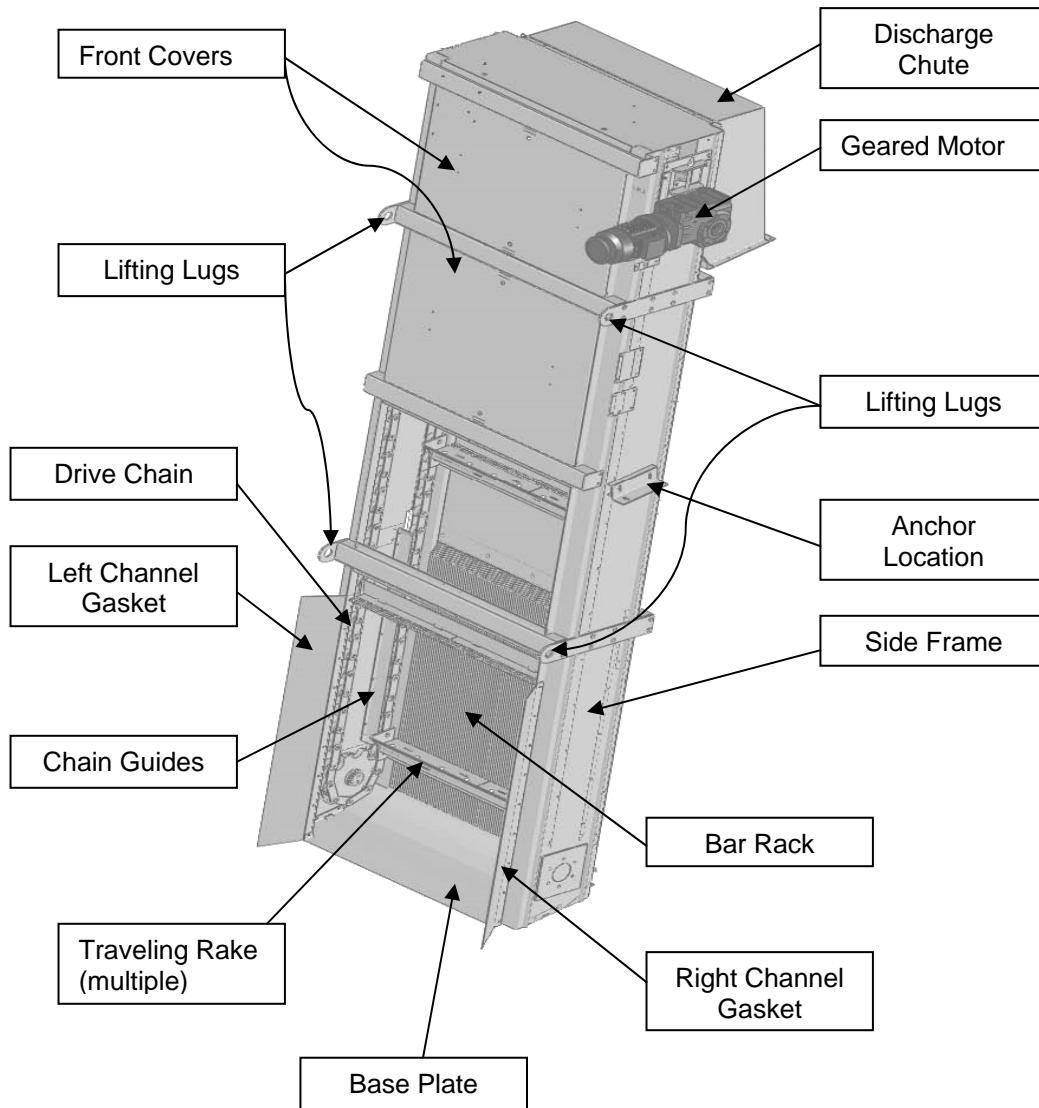


Figure 3.2

3.3 Inspect and Identify Components

A filter screen VMR Multi-Rake Screen consists of the following standard components: Please check the packing list against the shipment, then identify these parts.





Section 3 Installation & Start-up

3.4 Machine Placement

Upon satisfactory inspection of the channel and machine components, the screen is ready to be installed in the channel.

Take these precautions when placing the machine:

- Never apply excessive side loads to the frame. Side loads may cause the frame to bow or twist.
- While installing equipment, avoid pinching the frame between the channel walls when lowering. If binding and/or wedging of any part of the screen occurs, remove the screen and widen the channel opening. **DO NOT FORCE THE SCREEN INTO POSITION!**
- Never anchor the base plate and then pull or push on the frame to make it square with the channel. Doing so will twist the frame and cause misalignment and wear of the chain and rake assembly.

A. Positioning the Machine

- Position the upper level anchor assemblies (refer to the as-built drawings for component identification and match marking) around/against the screen.
- Carefully relax the lifting device but do not remove the lifting cables/chains. (Temporary shoring may be required.)
- Using a plumb bob, transit and levels, confirm the screen is installed as follows: (refer to Figure 3.4 and the General Arrangement drawing in Section 8.2)

Level: Place a level across the top-most corner of the top cover and frame.

Frame Sides: Can be used to check vertical. Use of a plumb bob is recommended.

Plumb: Using a plumb bob on each frame leg, the measured difference tolerance is $\pm 1/8''$ over 20'.

Square: The frame should be positioned as square to the channel opening as possible and the frame should be checked as shown on Figure 3.4

Note: Variances in the channel bottom may necessitate shimming the base plate to bring the frame into full plumb and square. Use stainless steel shims compatible with frame material, if required. Place shims only along the sides of the base plate so that the side frame is directly over the shim.

Figure 3.4 shows how to measure for machine level and square.

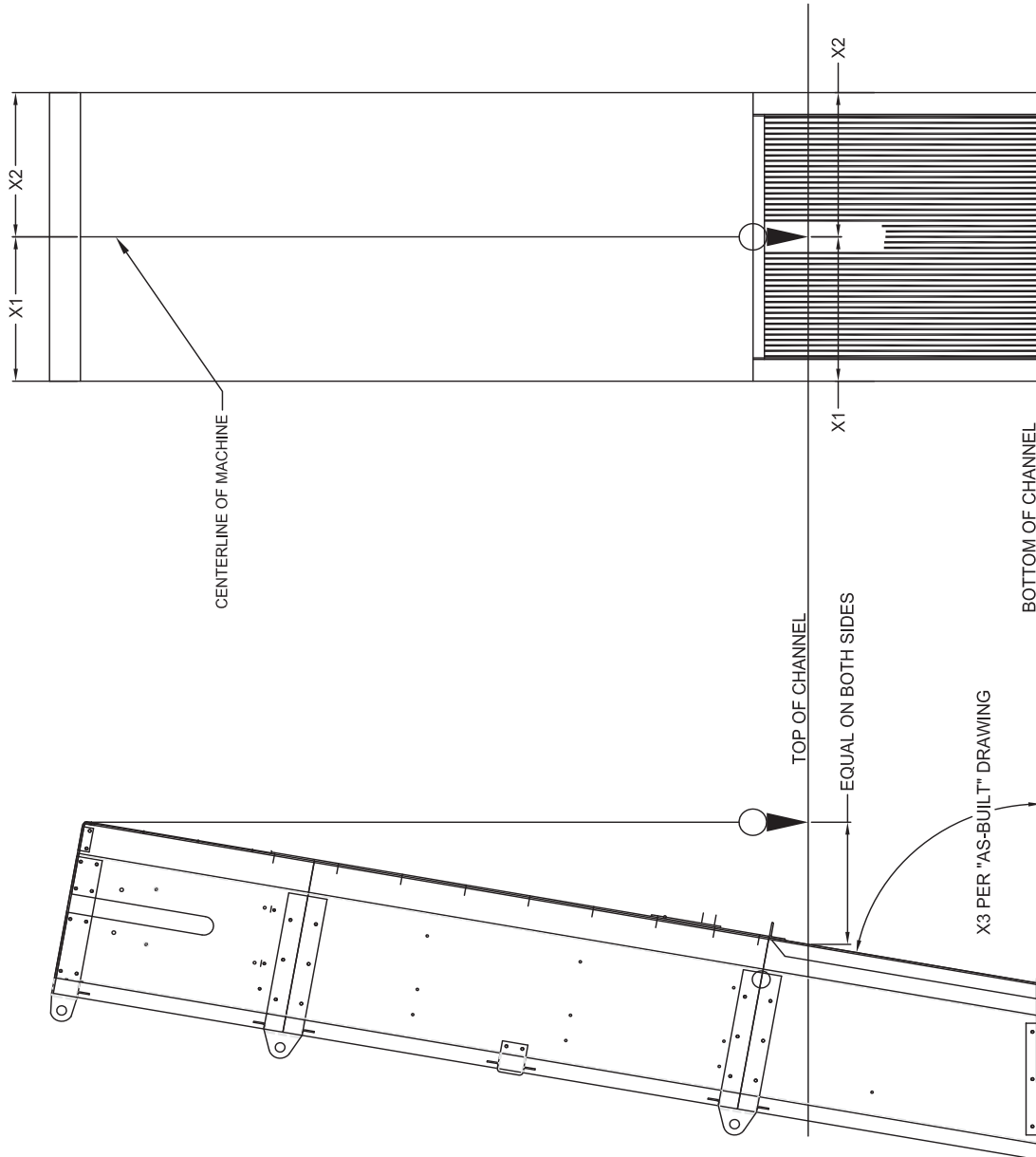


Figure 3.4

A. Anchoring

The following is a typical anchor connection for the VMR. When placing the anchors, a minimum edge distance in the flooring of 4" must be held to prevent breaking or blowing-out the flooring material. Refer to SECTION 8- PROJECT DATA for the machine and anchor positions as well as anchor types and instructions.

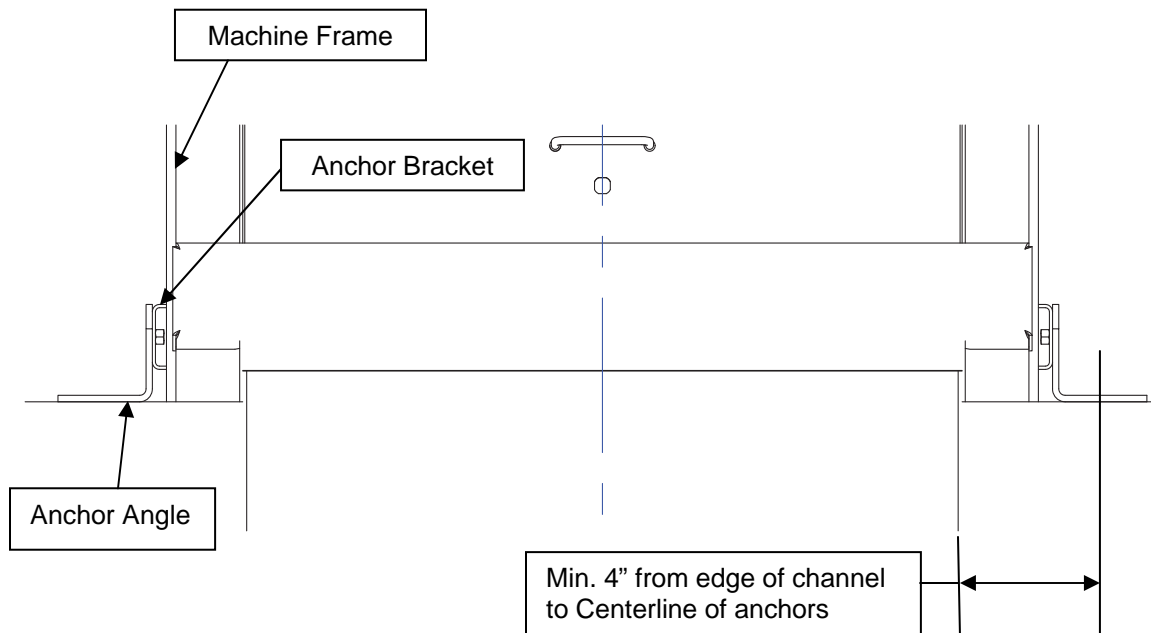


Figure 3.6 Typical Anchor Detail

B. Adjusting and Anchoring the Support Legs

Support legs are installed if rotation of the machine has been specified for the project. Support legs are installed and adjusted after the screen has been set to the correct angle and location according to the Approved General Arrangement Drawings.

For easier installation of the support legs, square up and level the machine first and then attach the support legs.

Refer to SECTION 8- PROJECT DATA for anchor bolt information on sizes and installation.

Install the support legs in the following manner:

- Slip the support leg assembly over the pivot pin.

Section 3 Installation & Start-up

- Set the support legs. Make sure that the anchors are a minimum of 4" away from any finished floor edge to prevent breaking or blow-outs.
- Drill anchors through the holes in the foot plate and adjust the bearing assembly as necessary.
- Tighten all hardware and set the foot plates approximately 1-1/2" off the finished floor for grouting.

Figure 3.7 details the support leg assembly.

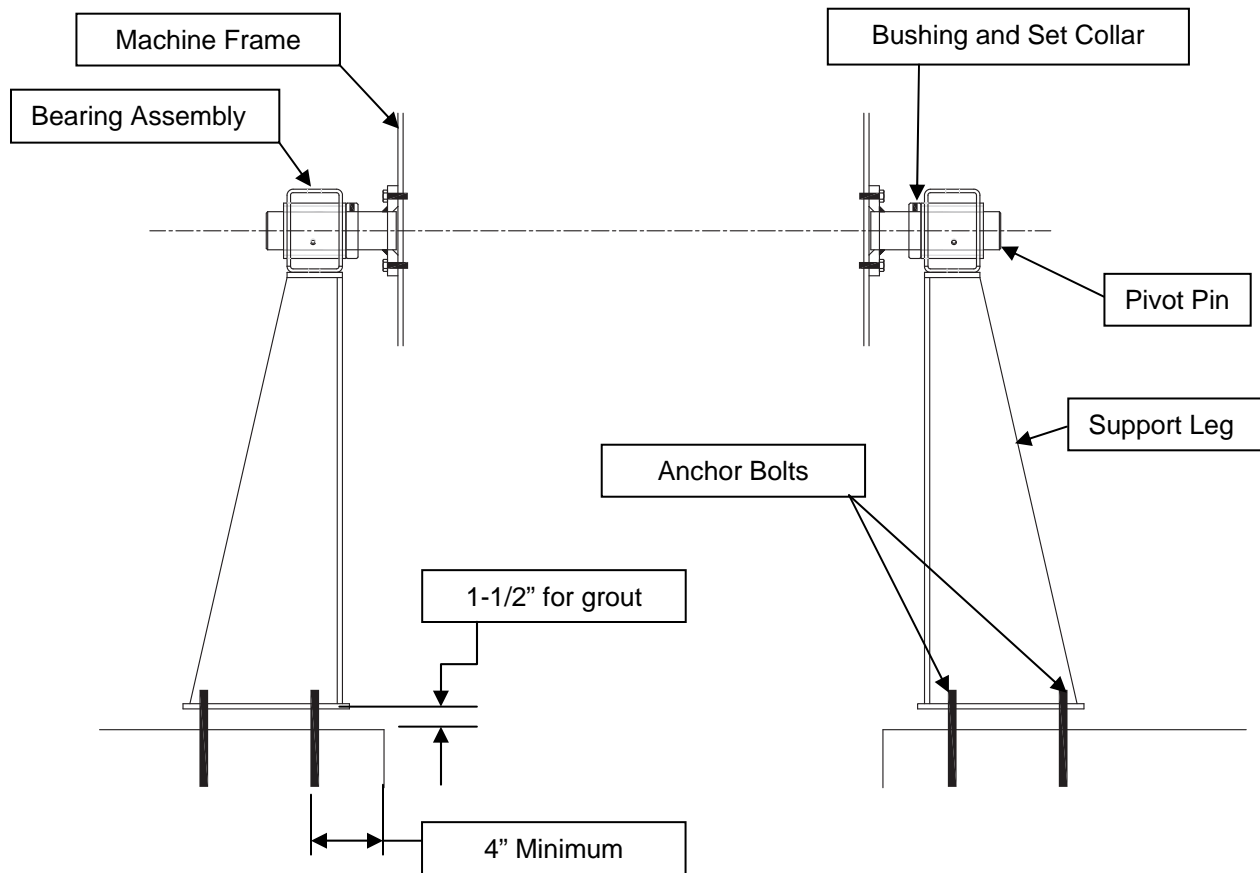


Figure 3.7 Support Legs

To prevent side movement, set screws are provided to screw into the set collar and prevent shifting.

Important! Vulcan Industries, Inc. uses all stainless steel hardware and anchor bolts for the assembly and anchoring of the equipment. Vulcan strongly recommends the use of an anti-seize lubricant specifically formulated for use with stainless steel on assembly hardware. Unlubricated hardware has a tendency to seize and cannot be properly tightened. Seized bolts must be replaced.

Bolt Torque:

| | |
|------|------------|
| 3/8" | 15 Ft. Lb. |
| 1/2" | 35 Ft. Lb. |
| 5/8" | 50 Ft. Lb. |
| 3/4" | 80 Ft. Lb. |

CAUTION

CAUTION: DO NOT GROUT AROUND SIDE FRAMES without consulting the factory or factory representative. This may cause warping of side frame. This equipment will not operate properly if side frames are not plumb.

C. Transducer Positioning

Figure 3.5 shows the proper transducer locations when being placed in the channel.

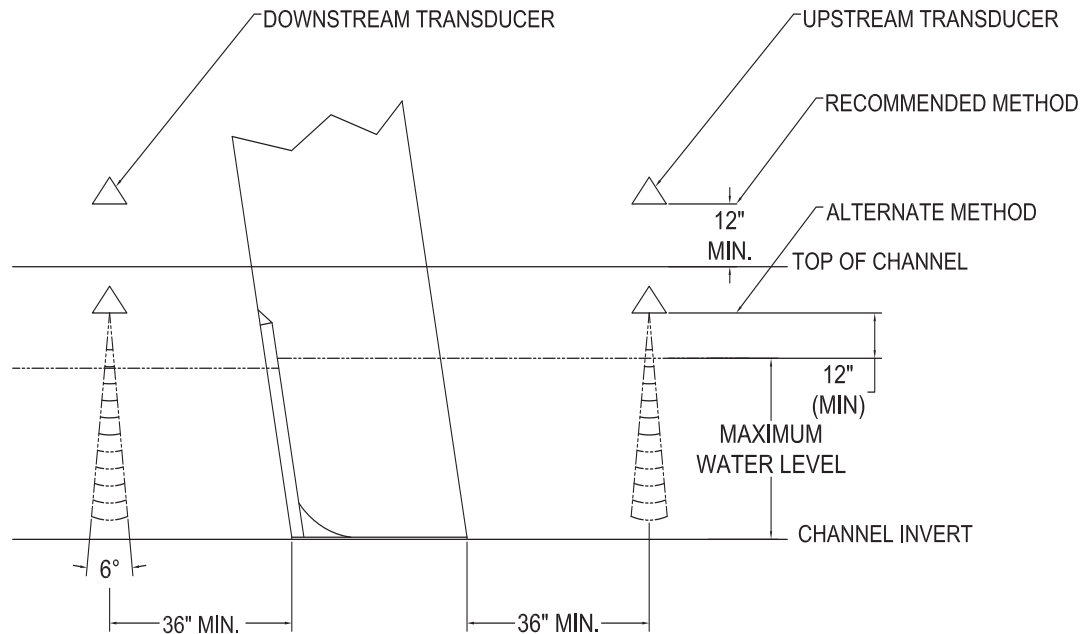


Figure 3.5 Transducer Position

Notes:

1. The upstream and downstream transducers should be mounted at the same elevation.
2. Dimensions shown are minimum recommendations. Consult factory if other installations constraints must be considered.

3. Transducers should be mounted above the top of the channel if possible, but must be a minimum of 12" above the maximum water level.

4. Transducers should be mounted over center of channel if possible, and must have no obstructions to the beam angle as shown above.

In deep channel installation, ensure that the beam angle does not come in proximity of the channel sidewalls.

3.5 Fitting the Channel Side Seals

Channels made of concrete generally have greater tolerances than fabricated channels. Accordingly the screen width is made smaller than the channel width. Two rubber side seals are provided with the screen to close the gap between the screen frame and the concrete channel. The side seals are held in place by a stainless steel flat bar which is bolted to the front of the frame.

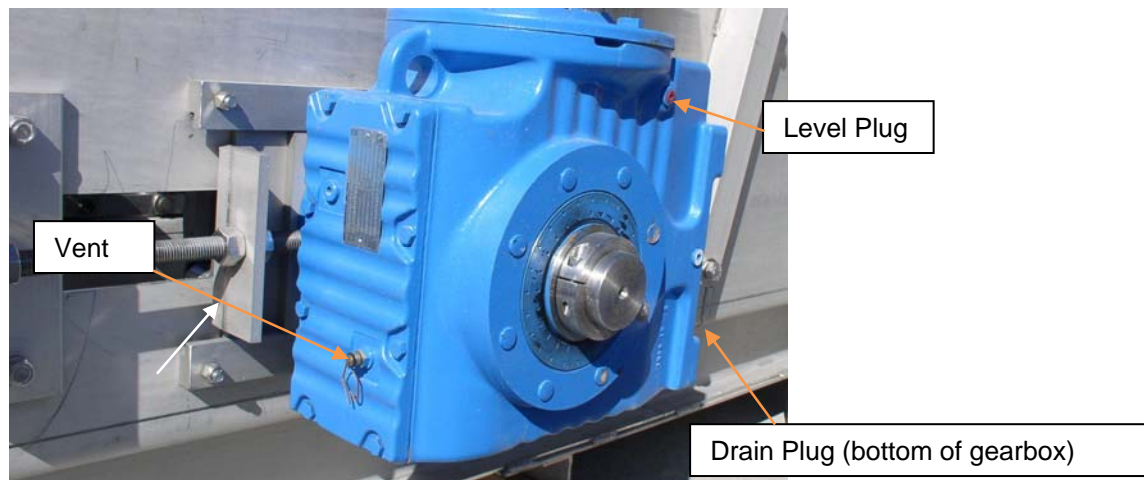
Water pressure forces the gasket against the channel wall to make a seal. The gasket and flat bars should be cut to the length of the screen frame from the bottom to the top of the channel. Be sure the gasket contacts the channel invert to avoid short circuiting.

If the space between the screen and the channel is more than 1-1/2" on either side, a baffle plate must be anchored to the channel wall over the total length of the seal. If baffle plates are required and they are not contained in the delivery, please contact **Vulcan Industries, Inc.**

3.6 Mounting the Gearbox Housing Vent

The gearbox of the driving unit is filled with oil at the factory. To be sure the oil does not leak during transportation, the vent plug is removed from the gearbox housing and the tapped hole is closed with a plug.

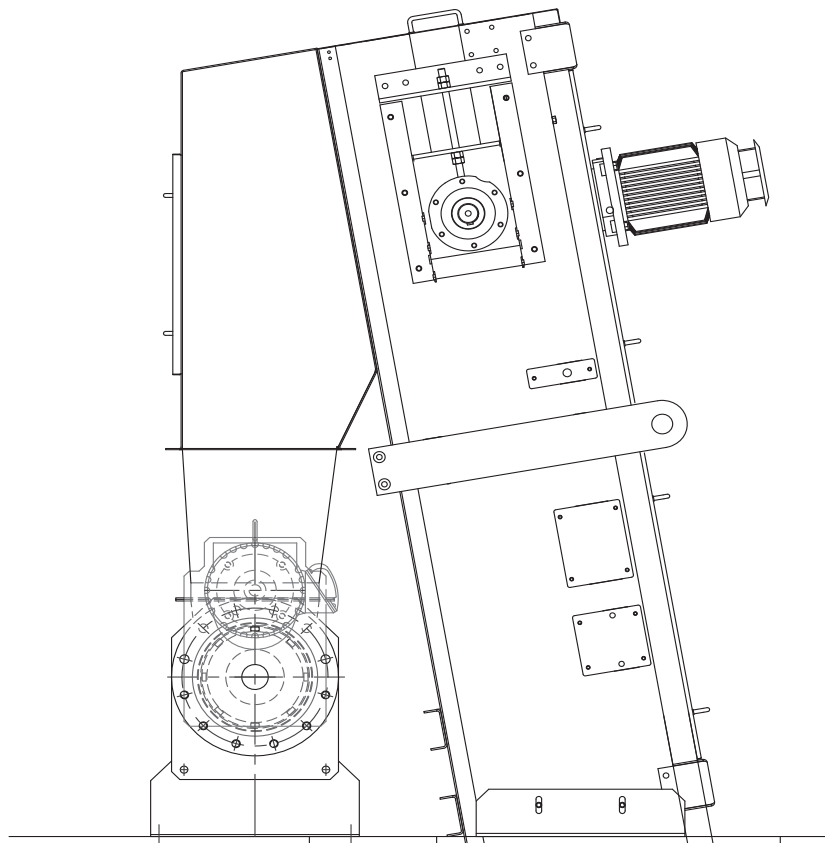
After the screen is set in its final installed position, the plug must be removed and the vent plug must be installed. Please save the removed plug for future use. Check the gearbox for proper oil level. See the following diagram.



3.7 Transition to Post-Screening Handling Equipment

The following design criteria for screening hoppers must be observed:

- Side walls of hoppers must be inclined to at least 60° from horizontal.
- Hopper width must be at least as wide as the free discharge width of the screen.
- Screen handling units must be of adequate capacity to fully remove all screenings.



Receiving hoppers manufactured by Vulcan Industries, when properly installed, will mate up with the discharge chute on the backside of the VMR machine. This interface is meant to bolt together and form a sealed connection. Check the Approved "As Built" General Arrangement drawings for location and interface of this equipment.

3.8 Start-up

The instructions in this section are an overview of basic operating functions of this machine. More detailed step-by-step functions and programmed operations are described in SECTION 7-ELECTRICAL CONTROLS. Refer to that section for more details.

A. Pre Start-up Check



Initial start-up is only to be performed by a trained factory technician. The technician must inspect the installation and provide the client with a certificate of proper installation. Only after the client has such a certificate in hand, may the equipment be started.

Starting the machine for a functional check, test run or commissioning is only to be carried out or arranged by a factory-trained technician.

The field connection between the control panel and the multi-rake machine must be made in accordance with local, state, and federal electric codes. Consult the Electrical Drawings in SECTION 7 of this manual for inner-connecting wiring requirements.



Licensed electricians must make the electrical connections.

The following steps must be observed when commissioning for the first time:

- Check all fasteners for tightness.
- Install all protective covers and guards.
- Check that all electrical protection devices (fuses, motor starter relay, smooth-starting device and current relay) are adjusted and activated.
- Check the direction of rotation of the drive motor. If the direction of rotation is correct, the upper drive chain rotates counter-clockwise (looking downstream). If the direction of rotation is wrong, the motor leads must be changed to achieve proper rotation.

B. Initial Start-up / Long Dormancy Cycle Start-up

Prior to initial start-up and following long shutdown periods, the following must be checked and verified for safety reasons.

- Make sure all tools, rags and other loose items have been removed from the machine.
- Perform all lubrication tasks as described under SECTION 5- MAINTENANCE.
- Prior to energizing the VMR, all electrical work and related mechanical work must be completed. Check that all mechanical and electrical lock-outs have been cleared.
- Verify that all electrical safeties operate properly.
- Close circuit breaker at the electrical control panel to energize the system.
- Using the local "Hand-Off-Auto" control switch, place unit in "Hand". Use the "Forward-Off-Reverse" switch to "jog" the drive motor to verify rotation. If rotating improperly, reverse two motor leads. If operating properly, test the reverse mode.



Section 3 Installation & Start-up

NOTE: The reverse switch is always spring loaded to prevent unattended operation.

- If system operates freely, then place mode controller in "Forward" position and allow the rake to travel to the bottom of the screen.
- Stop the rake near the bottom of travel and begin jogging the rake forward until the teeth engage the base plate and bar rack. The rake teeth should clear the base plate by ¼" and enter the bar rack without binding or shifting position. Removable rake tooth sections are slotted for adjustment. If necessary, loosen the teeth attachment bolts and center the teeth on the bar rack spaces. Refer to SECTION 5- MAINTENANCE for instructions on adjusting the rake.
- Continue to jog forward until the rake passes over the dead plate. Ensure that the rake teeth do not contact the dead plate. Teeth should clear the dead plate by 1/4 inch.
- If the rake teeth drag along the base plate, the rake will require adjustment. Refer to SECTION 5- MAINTENANCE for instructions on adjusting the rake.
- Operate the rake upwards through the bars and dead plate, stopping prior to reaching the wiper. Jog the rake forward until the rake shelf contacts the wiper blade. Make any adjustments necessary to ensure the wiper blade does not jam on the rake itself. Refer to SECTION 5-MAINTENANCE for instructions on adjusting the rake.
- Once the rakes and wiper have been properly aligned (See SECTION 5- MAINTENANCE for alignment instructions), place the rake in the forward direction and visually observe operation through three (3) complete cycles. The rake should travel freely with no signs of binding or jamming.
- Mode of operation may now be set at desired position (Hand-Off-Auto).



Section 4 Operating Procedure

4 Operating Procedure

4.1 Normal Operation

Starting

- Insure power is available to control panel.
- Verify power to drive unit.
- Make certain there are no other personnel working on this unit.
- Establish sewage flow.
- Place mode controller (usually a Hand-Off-Automatic or HOA for short) into desired position.

Stopping

- Shut down sewage flow.
- Place HOA controller to "OFF" position.



If sewage is not stopped, the screen may become blocked and require manual cleaning prior to restart.

A. Hand Operation

Hand operation should mainly be used for maintenance purposes. The rakes can be operated in the forward or reverse direction by setting the HOA controller to "HAND", then selecting either "FWD" (forward) or "REV" (reverse) at the local control panel.

The "REV" (reverse) position is a spring return to off-switch that prevents the machine from running unattended in the reverse direction.

Quick Manual Start-up

The VMR can be run manually in forward or reverse by:

- At main control panel, set disconnect to "on".
- At main control panel, set control power to "on".
- At local control panel, switch for-off-rev to "off".
- At local control panel, switch hand-off-auto to "hand".
- At local control panel, pull out emergency stop switch.
- At local control panel, switch for-off-rev to "for" for forward, or "rev" for reverse.

Note: Local control switches may be incorporated into the main control panel. See Device Functions in SECTION 7.2 for complete electrical sequenced operation and switch locations.

Shut-down

- The multi-rake can be stopped at any time by pressing the emergency stop button at the local control panel, or by turning the HOA to "off".



Section 4 Operating Procedure

B. Automatic Operation

Automatic operation is used as the primary operating mode. The “START” signal will be from a repeat cycle timer, float switch, differential level input and/or a remote start signal (depending on the design specifications). (Reference SECTION 7-ELECTRICAL CONTROLS for more information.)

Quick Automatic Start-up

The multi-rake can be run through a complete cycle by:

- At main control panel, set disconnect to “on”.
- At main control panel, set control power to “on”.
- Automatic control device programmed or enabled.
- At local control panel, switch for-off-rev to “off”.
- At local control panel, switch hand-off-auto to “auto”.
- At local control panel, pull out emergency stop switch.

Note: Local control switches may be incorporated into the main control panel. See Device Functions in SECTION 7.2 for complete electrical sequenced operation and switch locations.

Shut-down

- The multi-rake can be stopped at any time by pressing the emergency stop button at the local control panel or by turning the HOA to “off”.

4.2 Protective Devices

- High Torque Protection:
The circuitry within the variable frequency drive (VFD) is used to monitor the three-phase motor circuit. When the motor has exceeded the VFD set point, the VFD will de-energize the motor. The VFD is calibrated at the factory.
- Motor Thermals (if present):
The motor has heat sensing thermals imbedded in the windings. When any of the thermals overheat the motor starter is de-energized, stopping the equipment.
- Fuses and Breakers:
Used to provide short circuit protection.
- Emergency Stop Push Buttons:
E-stop push buttons are located on the local control panel and/ or the main control panel. Pushing the button in will shut down the equipment, whether in hand or auto mode. To reset the E-stop, the button must be manually pulled out.

4.3 Emergency Stop / Restart

Activate the E-Stop during an emergency situation to immediately stop the machine from operating. Restart the machine by:

- Pulling the E-Stop button out.
- Restart the machine in the desired operating mode.

4.4 Forced Operation

If the drive system has not been activated by the transducer level differential within the period of one hour, the machine will automatically cycle one for a preset adjustable amount of time.

5 Machine Maintenance

5.1 Safety Precautions

Vulcan Industries, Inc. will not be responsible for any harm or injury that may result from the improper operation of this equipment. Furthermore, Vulcan Industries, Inc. will not guarantee this equipment if improperly operated or operated without the designed safety features. For your safety when working on this machine, please follow these suggested precautions:

- Only fully trained and authorized personnel should be permitted to enter owner defined boundaries around, within or on any equipment or components that present a potential for injury through a lack of knowledge concerning proper safety precautions.
- Warning signs and labels shall not be removed or obscured at any time.
- Material handled by this equipment may come under the scope of materials classified as “**Bio-Hazardous Material**”. Appropriate precautions must be taken to protect personnel from exposure.
- Protective guards and covers must be in place before operating this equipment.
- Control panels may have more than one source of power. Make sure all potential power sources are locked out prior to performing any maintenance or repair.
- Before attempting removal or repair of the rake assemblies or motor, the drive assembly must be secured against possible movement.

5.2 Inspections and Preventative Maintenance Schedule



DANGER! To prevent injury or death, do not perform any maintenance functions that require reaching into the machine while the machine is under power. Follow proper lock-out tag-out procedures first. Then perform maintenance functions.

A. Daily

Check the machine operability. Always look out for damaged parts. Damaged components can jeopardize the safety of personnel and equipment. Replace any damaged parts immediately!

During operation try to observe the following:

- Any unusual noises heard as the machine is running.
- Oil leakage from the gearbox.
- Motor runs abnormally hot.

Check for jammed solids and deposits. Any jammed solids or objects that are considered uncharacteristic for screenings must be removed as these can damage the rakes.

- Follow the Emergency Shut-Down Procedure as described in SECTION 4: OPERATION.
- Remove residual solids from between the bars with a suitable tool.
- Restart the system as described in SECTION 4: OPERATION.

Check the rakes for damage. Check to see if the teeth on the rakes are functional.

- Rakes with broken or bent teeth should be replaced with new tooth sections.

B. Weekly or After 30 Operating Hours

Check the wiper. The wiper should continuously clear the rakes in an unimpeded manner. Check the wiper operation for:

- Any materials that have adhered to the wiper blade. These need to be removed.
- Warped or gouged wipers should be replaced.

Clean and remove deposits from the chains. Avoid cleaning electrical components with a water jet to reduce the risk of electrical shock.

- Wash off the outside of the machine with a suitable cleaning device. Avoid spraying directly or excessive overspray onto the electric motor.
- Remove deposits from the wiper and discharge chute.

C. Monthly or Every 100 Operating Hours

Check the safety devices. Never operate the machine with faulty safety devices. Fix all defective safety devices immediately!

- Place the machine in manual mode (see SECTION 4: OPERATION for instructions).
- Begin the machine cycle.
- Activate the E-stop. The machine should come to a full stop.
- Pull out the E-stop button and cycle the machine again.
- Do this with all safety devices on the machine.

Check protective motor switches and overload relays. Refer to SECTION 7: ELECTRICAL and SECTION 6: DRIVE DATA for instructions and information on testing these components.

Check sprockets, drive chain, bearings and gearbox.



DANGER! The examination of these items requires observing the machine within as it is running. DO NOT attempt to reach or extend yourself into the machine as it is running!

When checking the chain drive system:

- Put the machine into an E-stop condition and remove the front covers so you can see the chain, sprockets and drive system.
- Reset the machine. Start the cycle in manual mode as described in SECTION 4: OPERATION.
- Visually inspect the sprockets and drive chains for damage and excessive wear.
- Check the drive shaft and bearings for concentricity and smooth turning.



Section 5 Machine Maintenance

- Check the gearbox for leakage.
- Check the gearbox temperature for excessive heat.
- After the check, replace the covers and place the machine back to normal operation.

Lubricate:

- With a grease gun, lubricate the machine grease points (called out later in this section) with petroleum grease, Allied Mega Blue LC 500 or equivalent.

D. Semi-annually or Every 600 Operating Hours

Check the fasteners. Perform the following maintenance items:

- Check all fasteners for tightness.
- Check all electrical connections for cleanliness and secure fits.
- Secure or tighten any loose connections.

Check the chain tension. When setting the tension do not over-tighten the chain.

- Drain the channel and wash the lower bearings with a high-pressure wash in order to remove any debris in the lower bearing area.
- Rotate the rake heads so that none are pivoting around the lower bearing.
- Lock-out the machine.
- With a feeler gauge, measure the gap between the bearing ring on the lower journal and the chain rollers. The gap should measure 1/32 or .032 inches. The gap should not exceed 1/16 or .063 inches and the rollers should only touch the bearing ring on the upward rotation.
- If the tension needs to be adjusted, follow the adjustment instructions detailed later in this section.
- After inspection, return the machine to normal operation.

Check gearbox oil level and consistency

- Lock-out the machine.
- Open the drain plug as shown in figure 5.2 and check the oil for consistency. The oil should smell fresh and not burnt or dirty. The oil should look clear or transparent and not black or gray.
- Remove the oil level plug as shown in figure 5.2.
- Observe the oil level; it should be even with the bottom of the view-hole and readily visible. If oil is not visible from the view-hole the machine is low and oil needs to be added. Refer to SECTION 6- DRIVE DATA for prescribed oils to use. If oil seeps from the view-hole, there is too much and oil must be drained. Allow the excess oil to drain from the view-hole into an appropriate waste oil container until it is level with the view-hole.

Clean the drive and gearbox ventilation. Remove the gearbox vent as shown in figure 5.2 and clean with air or cleaning solvent. Replace the vent when cleaned.

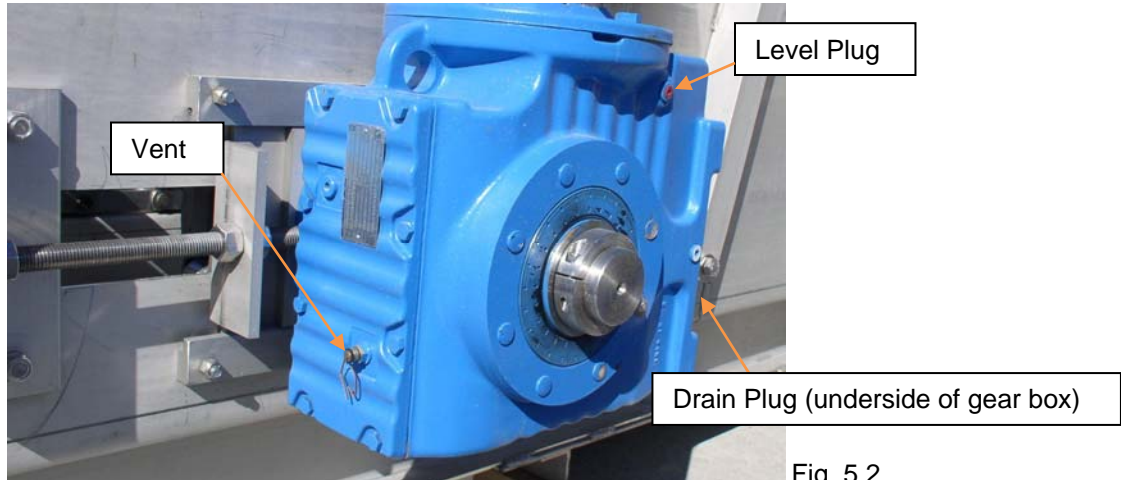


Fig. 5.2

E. Annual Inspection

Check the drive unit:

- Check the motor and gearbox for damage and excessive wear.
- Check that all fasteners are secure and tight.

F. 2 Year Inspection

Replace gearbox oil. Replace the gearbox oil by:

- Lock-out the machine.
- Remove the drain plug as shown in figure 5.2 and drain the oil into a proper waste oil container.
- Replace the drain plug.
- Through the vent hole add new oil into the gearbox. Use oil as prescribed in SECTION 5.5 and quantities as listed on the data sheets in SECTION 6.
- Check the oil level as detailed in 5.2.
- Replace the vent cap and oil level plug when properly full.



Section 5 Machine Maintenance

5.3 Maintenance /Lubrication Schedule

| Occurrence | Inspection | Activity |
|-------------------------|--|---|
| Daily | Entire Machine | Check operability |
| | Screen | Check for jammed solids and deposits |
| | Clearing Rake | Check for broken teeth |
| Weekly (30 hrs) | Wiper | Clean |
| | | Check operability |
| | | Check for wear |
| | Entire Machine | Clean the outside |
| | Discharge Hopper | Clean |
| Monthly (100 hrs) | Safety Devices | Check operability |
| | Protective motor switch and overload relay | Check reference variables |
| | Sprockets and chain | Visual inspection for defects |
| | Bearings and Shaft | Check for concentricity and smooth running |
| | Gearbox housing | Check for leaks and high temperature |
| | Bearing mount, drive shaft | Lubricate all grease points |
| Semi-annually (600 hrs) | Fastener connections | Check for secure fit, tighten loose connections |
| | Electric connections | Check for secure fit, tighten loose connections |
| | Chain | Check tension, adjust if necessary |
| | Drive unit | Clean ventilation |
| | Gearbox | Check oil quality |
| | | Clean vents |
| Annually (1200 hrs) | Drive unit | Check for leaks and damage |
| | | Check fasteners |
| 2 years | Gearbox | Change oil |



Section 5 Machine Maintenance

5.4 Required Tools

The following is a categorized list of tools to have available when working on this machinery.
Hand Tools:

- Standard maintenance tools (i.e. screwdrivers, allen wrenches, socket, open-end and box-end wrenches up to 1-1/2" and if possible, metric up to 32mm, punches, etc.)
- 18" crescent wrench
- Channel lock pliers
- Tape measure
- Feeler gauge set
- Metric allen wrench set
- Torque wrench with a minimum rating of 100 ft/lbs.
- Voltage / Amp meter

Lifting Devices:

- Lifting device sufficient enough to lift the machine from the channel
- Heavy duty 1/4" cable come-along
- Nylon or cable lifting straps

Safety Devices:

- Lock-out Tag-out as required by local policy
- Hazardous gas detector
- Appropriate work attire and gloves

5.5 Recommended Lubricant Types

These recommendations are not intended to be the only types/brands of lubricants that may be used on this type of equipment. (Lubricants of the same characteristics may be supplemented.)

Manufacturer / Brand

GEAR REDUCER OILS:

- | | |
|---|-----------|
| <input type="checkbox"/> Mobil SHC-634 (provided with units, recommended by mfg.) | Synthetic |
| <input type="checkbox"/> Shell Omala 460 HD | Synthetic |
| <input type="checkbox"/> Shell Omala 680 | Petroleum |
| <input type="checkbox"/> Mobil gear 600 XP 680 | Petroleum |

GREASES (multi-purpose)

- | | |
|---|------------|
| <input type="checkbox"/> Mega Blue LC-500, EP-2 (used by Vulcan Industries) | Petroleum |
| <input type="checkbox"/> Mobil Mobilith AW-2 | Petroleum |
| <input type="checkbox"/> Or equivalent AW-2 or EP-2 | Petroleum |
| <input type="checkbox"/> Mobil FM-102 | Food grade |

5.6 Lubrication Points

Fig. 5.6 Wiper Pivot: 2x grease lines (one on each side of the frame for each bearing).

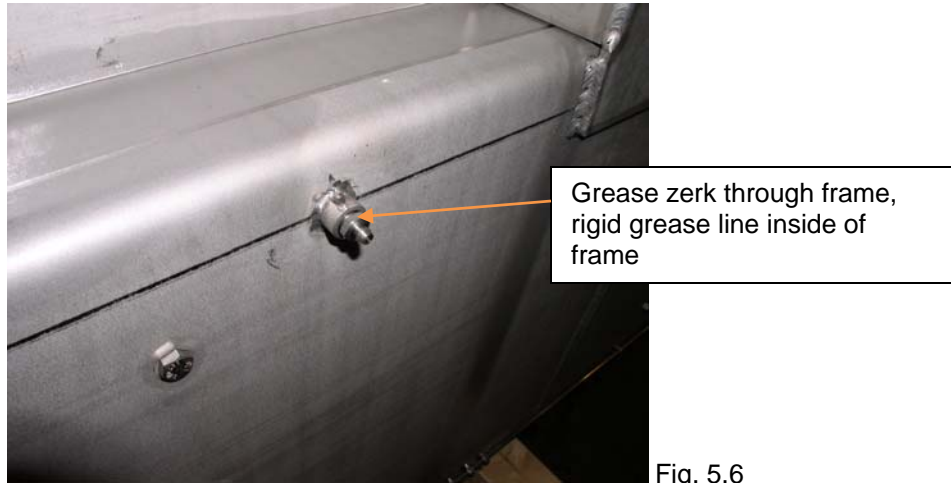


Fig. 5.6

Fig.5.6.A Drive Shaft: Flange block grease line (on opposite side of motor and gear box).

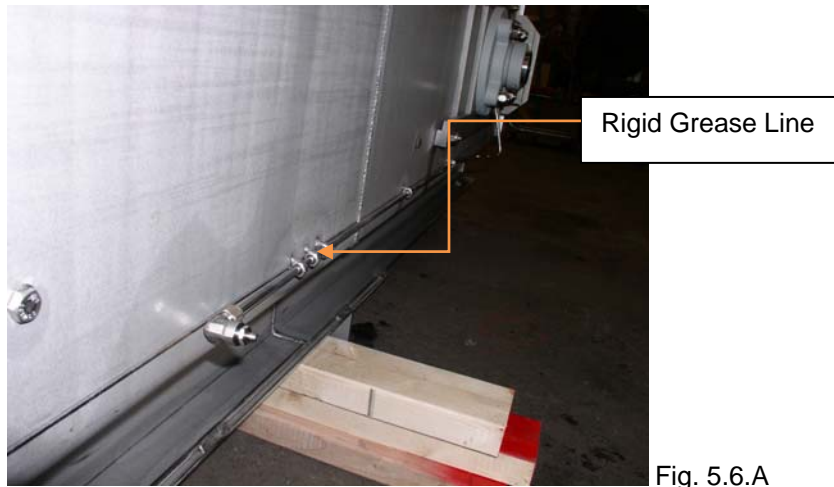


Fig. 5.6.A

5.7 Machine Adjustments

A. Rake Adjustment

The rake adjustment is set at the factory and should not need any adjustment prior to start-up. However, over time the rake may need to be realigned or adjusted for proper depth setting.

There are two bolts on each end of the rake assembly that allow for setting the depth and alignment.

- Loosen both bolts on the inside of the rake pan as shown in figure 5.7 (one on each side of the screen).
- Measure $\frac{1}{4}$ " of clearance between the rake teeth and the dead plate. Check that the rake assembly is level across the width of the screen.
- Retighten the bolts.
- In manual mode, run the rake cautiously through the wiper to ensure that there is no interference or jamming with the wiper.
- If all is satisfactory, replace all access panels and switch the machine into automatic mode for normal operation.

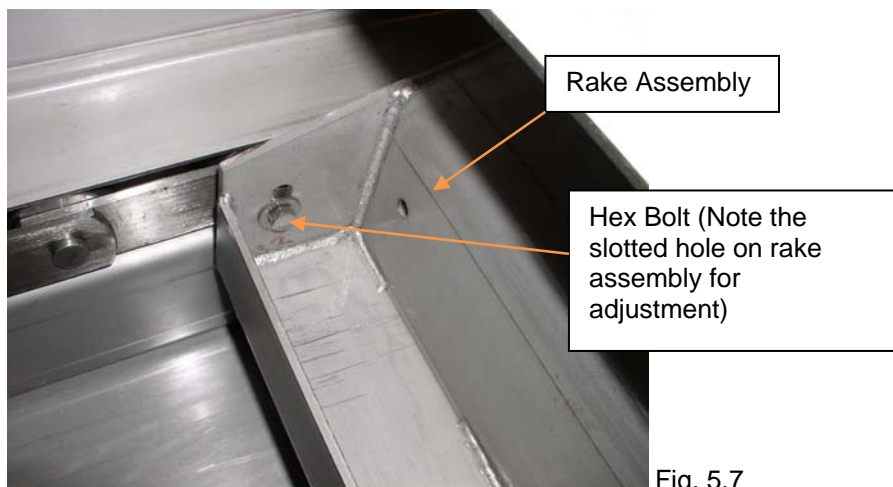


Fig. 5.7

B. Chain Drive Tension Adjustment

The drive chain for the rakes can be adjusted for tension. This should be checked regularly as a slack chain indicates worn components.

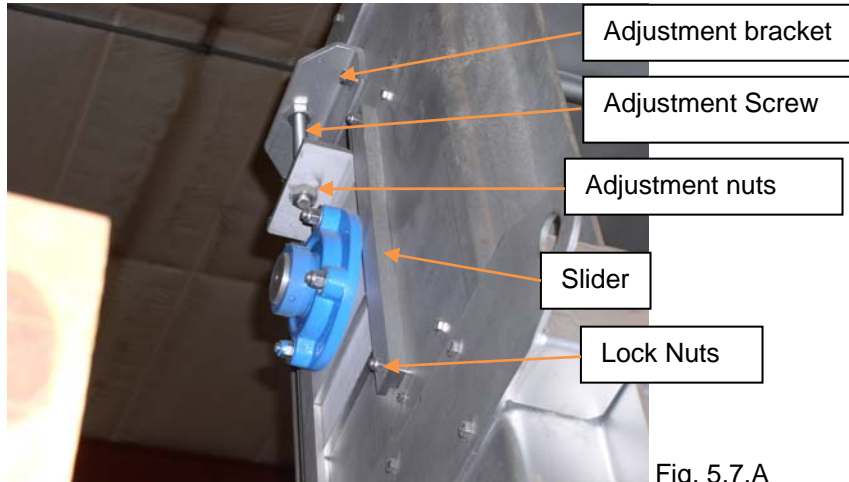
The tension system consists of two adjustment brackets, sliders, an adjustment screw and nuts. There are two of these tension systems, one on each side of the frame and all adjustments must be made equally on both sides. (See figure 5.7.A for details.)

Adjust the chain tension by:

- Using a feeler gauge, measure the gap between the bearing ring on the lower journal and the chain rollers. The gap should measure $\frac{1}{32}$ or .032 inches. The gap should not

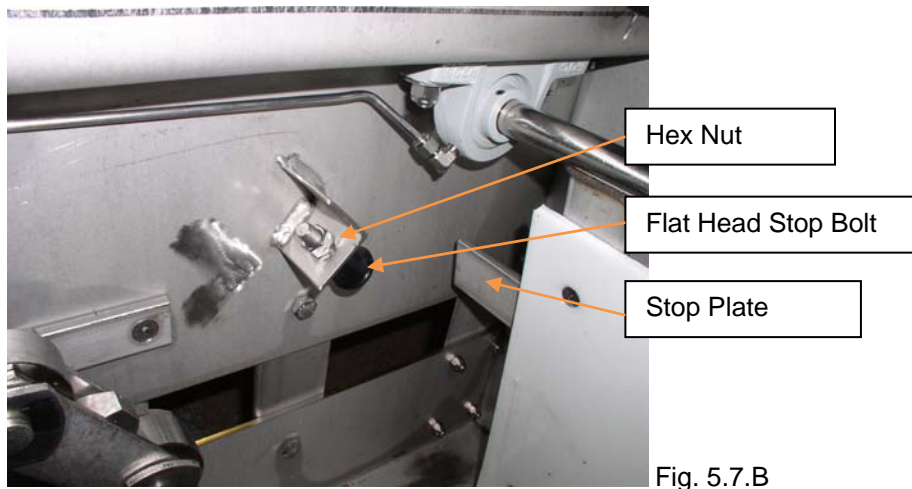
exceed 1/16 or .063 inches and the rollers should only touch the bearing ring on the upward rotation.

- Loosen the nuts on the adjustment screw and the lock nuts on the sliders.
- Rotate the adjusting nuts to slacken or tighten the tension on the chain.
- Retighten all the nuts when the proper tension is set.



C. Wiper Assembly Stop Adjustment

The wiper is cushioned to the stop position by a pair of adjustable stop bolts (See Fig. 5.7.B). The position of these bolts determines the wiper's "stop" point. To adjust the stop, loosen the nuts and rotate the bolt until the wiper assembly has the proper range of motion that does not allow the wiper to bind with the rake.



5.8 Component Replacement

A. Wiper Replacement

Over time the wiper plates wear and need replacing. To replace the wiper plates:

- Position the rakes so there is easy access to the wiper plate and blade.
- Remove the flat head screws that hold the wiper plate. (See Fig 5.8.A1)
- Remove the flat head screws that hold the wiper blade. (See Fig. 5.8.A2)
- Replace the old plates with new ones and replace the flat head screws.
- Run one manual cycle to check for proper operation and adjust the stops if necessary.

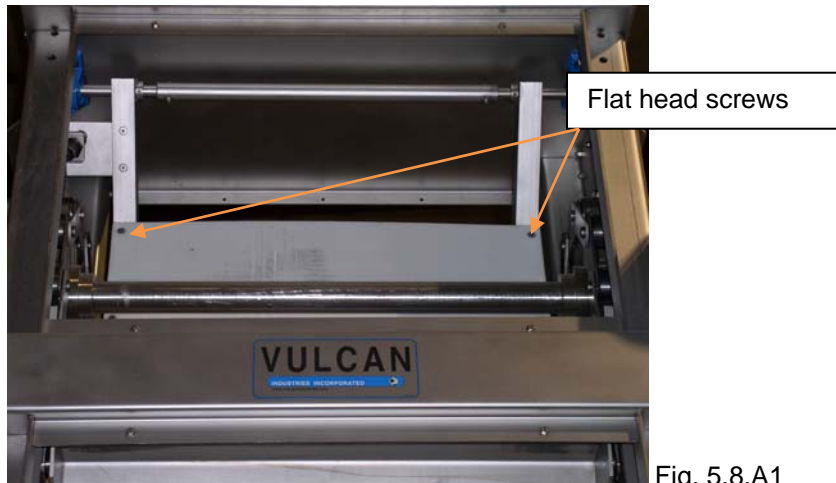


Fig. 5.8.A1

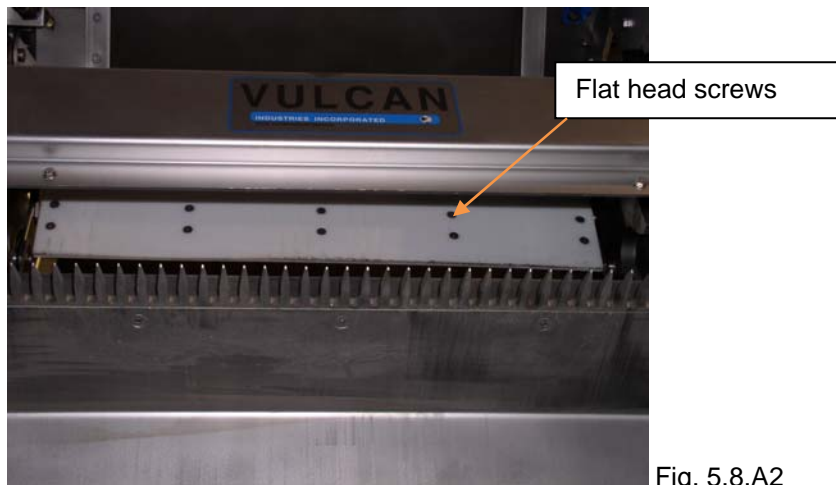
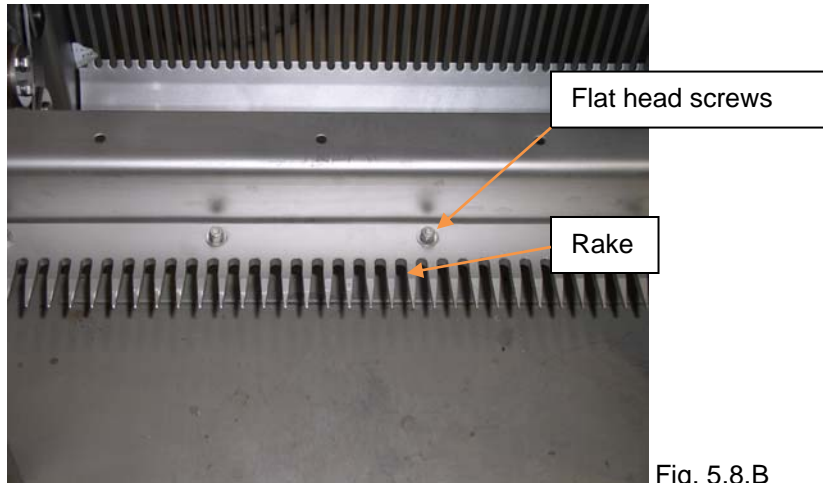


Fig. 5.8.A2

B. Rake Replacement

Through wear and time some rake teeth may break off and need replacing. To replace a section of rake teeth, position the rake assembly in the center of the access hatches. Remove the access hatches to properly work on the rake head. Remove the flat head screws (see Fig. 5.8.B) used to mount the rake teeth to the rake assembly. Replace the old teeth with the new ones and replace the flat head screws.



C. Chain Replacement



DANGER! REPLACE ONLY ONE CHAIN SECTION AT A TIME! To avoid damage to the machine and fatal injury to personnel, only one chain should ever be disconnected at one time.



DANGER! CHAINS ARE HEAVY! Always use a mechanical lifting device to assist in lifting and supporting the chains. Make sure the chains are supported properly before any master links are loosened. Always use the lock pins provided to support the chains from falling.



Items to note before working on the drive chains:

- Chains weigh 7 lbs. per foot. Provide supports accordingly to handle this load.
- Replace chains when the tension adjuster has topped out and cannot be adjusted any further.
- Small parts may fall into the channel. Make sure all master link pieces and supporting hardware are properly handled to avoid losing them. Use mechanical support devices to assist in supporting heavier components in order to allow for free hands when working.

The following detail shows all the loose components to the master link.

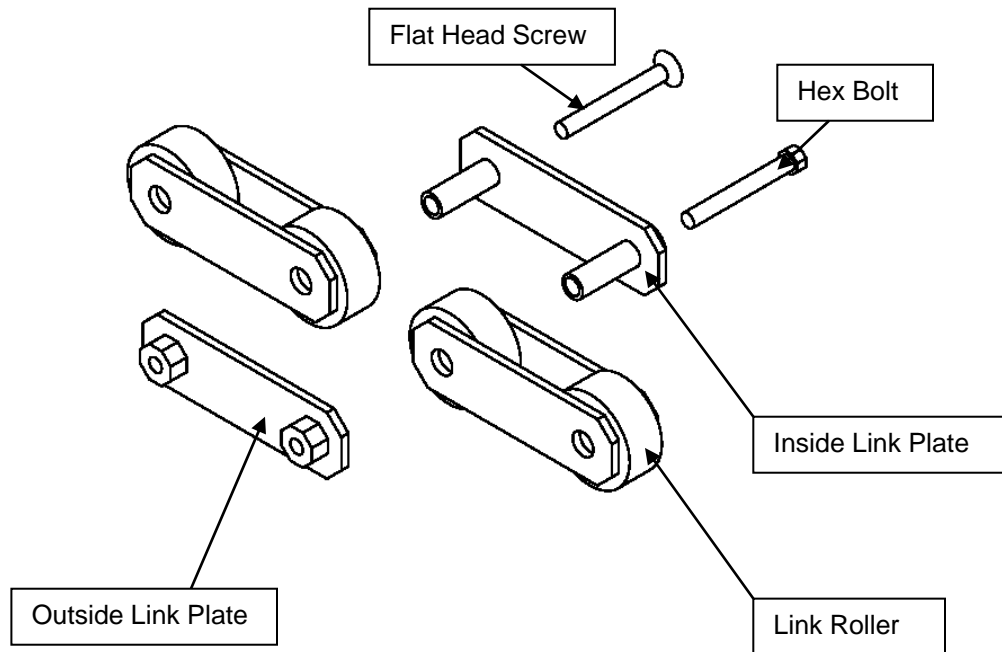


Fig. 5.8.C

- If possible, rotate the machine horizontally up out of the channel to provide easier maintenance on the machine.

Over time the drive chain may need to be replaced. Perform the following steps in order to replace the chain:

- Remove both access hatches on each side of the machine frame.
- Position one of the rake assemblies so that the rake heads are centered within the access hatch openings. (See Fig. 5.8.C1 for the access hatch). Note that the rake heads are attached to the drive chain by the master links.



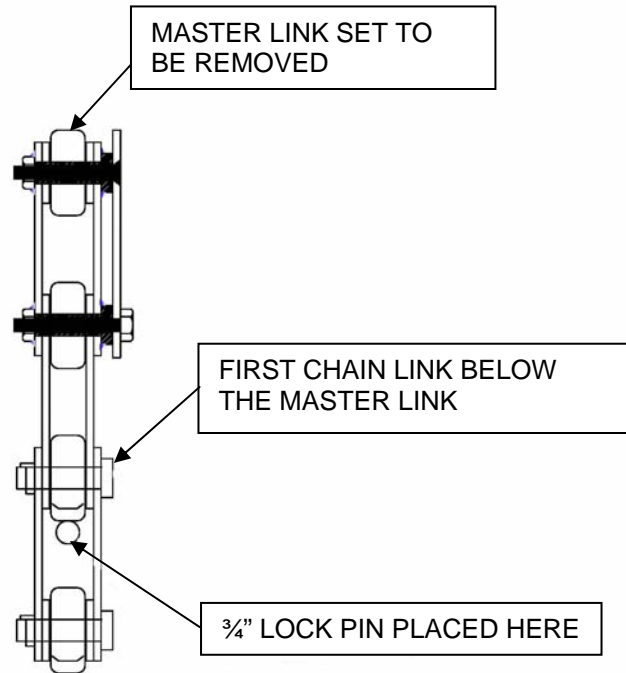
Fig. 5.8.C1

- Place the $\frac{3}{4}$ " lock pins into the pin holes on the frame of the machine. These holes can be found just a few inches below the access hatches. (See Fig 5.8.C2)



Fig. 5.8.C2

- Refer to the diagram below. The lock pin must be placed in the link just immediately below the master link. The pin must fit between the two rollers in the link. Failure to do so will result in the chain falling into the channel.



- Remove the flat head bolts and hex head bolts that hold the master link and rake head assembly together. (See Fig. 5.8.C3 AND 5.8.C4.) REMOVE ONE SIDE OF THE RAKE HEAD AT A TIME!

Disconnect the rake head from the chain that is not being maintained first. Replace the bolts back into the master link; then remove the rake head from the chain that is receiving maintenance. Failure to follow this step closely will result in the chain and sprocket back-spinning and damage to the machine or death may result!

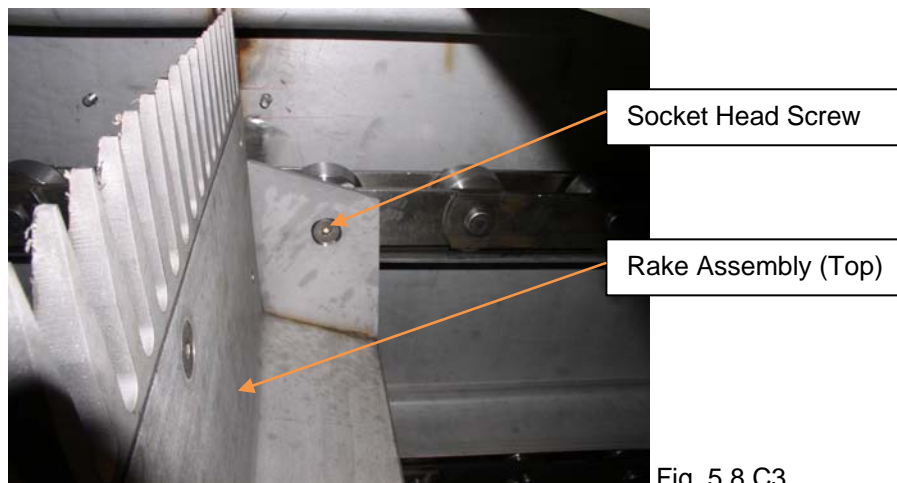


Fig. 5.8.C3

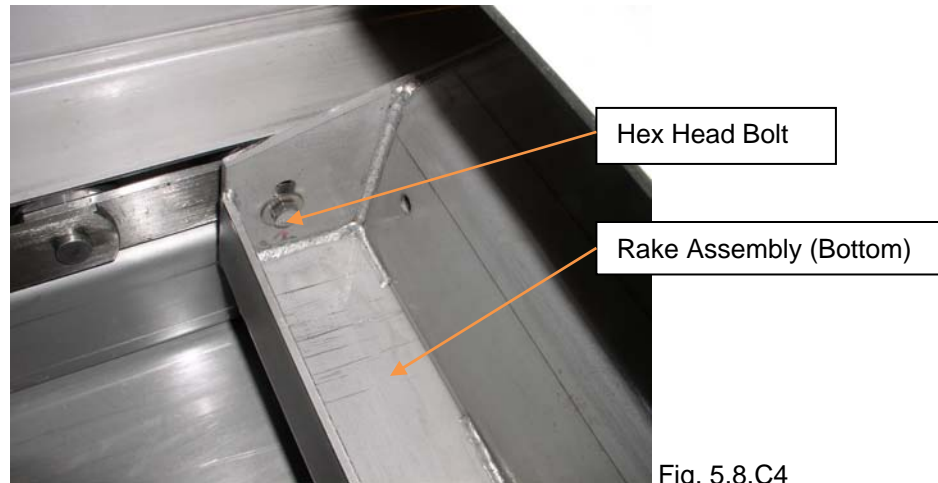


Fig. 5.8.C4

- On the chain being maintained, pull the master link apart and keep these pieces with the rake assembly. Take care not to drop these pieces! (Refer to Fig. 5.8.C for details.)
- Attach the new chain to the existing lower chain section (See Fig. 5.8.C5). Reattach the rake head to the chain.

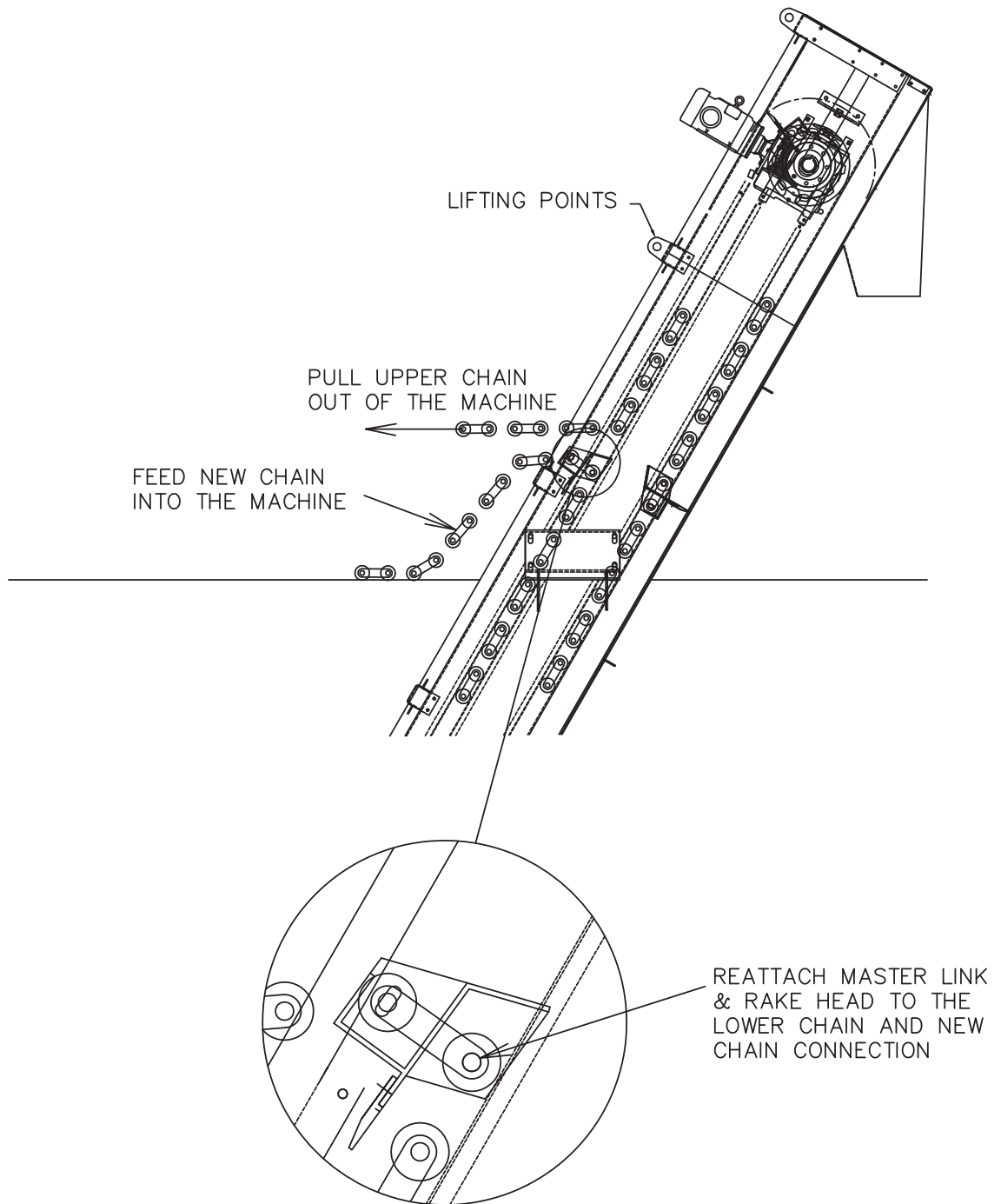


Fig. 5.8.C5

- Connect a controlled descent device onto the lifting lugs above the access hatch opening then strap this device onto the rake head assembly. (See Fig. 5.8.C6).

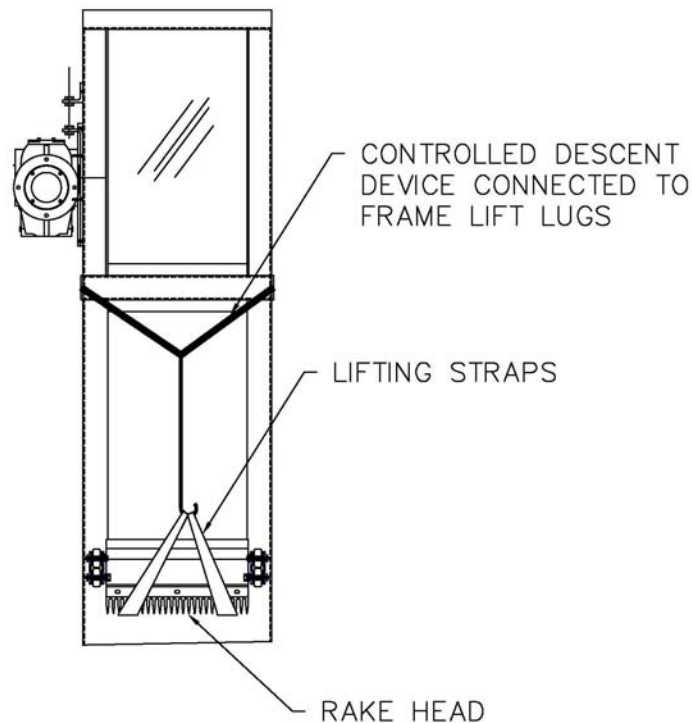


Fig. 5.8.C6

- Tension the upper chain.
- Pull the lock pins.
- Using a combination of the controlled descent device and short motor pulses, lower the new chain section into the machine while pulling the upper chain section out of the machine. (See Fig 5.8.C5).
- Keep rotating the chain until the next master link connection is centered in the access hatch.
- Put the lock pins in place.
- Remove the rake head from the chain.
- Remove the old chain section. (Keep hold of all the loose master link pieces.)
- Reattach the new chain section and rake head to the master link.
- Repeat the process of connecting a new chain over again until the entire drive chain has been replaced.
- Perform these steps for the drive chain on the opposite side when finished.
- When finished replacing both chains, set the tension back to the factory tension setting as shown in SECTION 8.4. The marking on the slider plate must align with the mark on the frame. From there, measure the gap between the bearing ring on the journal and the chain rollers. This gap should be .032 inches. Adjust the chains accordingly.

D. Upper Sprocket Maintenance

Contact Vulcan Industries, Inc. should any maintenance issues arise in regards to the upper sprockets. The sprockets need to be factory assembled and require a complete dismantling of the chains and drive system.

E. Replacing the Motor

Remove the motor by disconnecting all power to the motor and then unbolt it from the gear box. Make sure the new motor configuration completely matches that of the old motor.

F. Replacing the Outer Shaft Bearing

Perform the following steps when replacing the outer shaft bearing: (Refer to Fig. 5.8.G1)

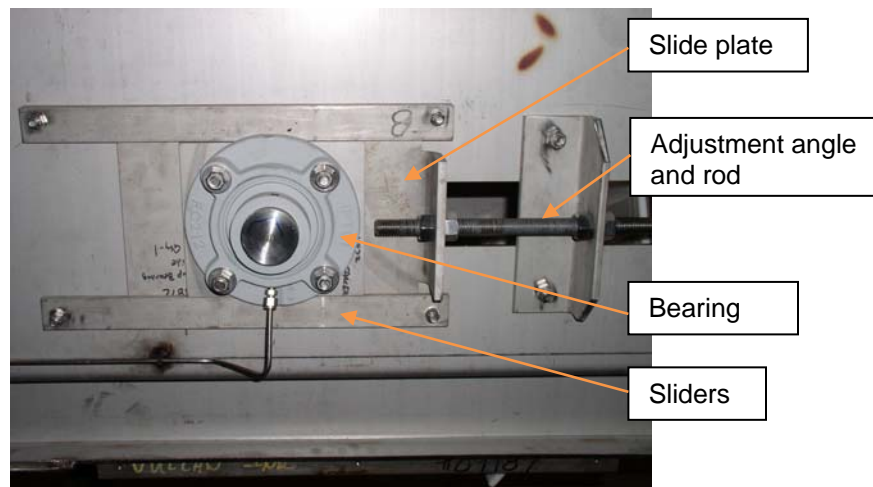


Fig. 5.8.G1

- Support the drive shaft from inside the machine to prevent it from falling.
- Separate the tension slide plate from the adjustment angle by unbolting the adjustment rod.
- Remove the slide plate from the frame by unbolting the sliders. Make sure to disconnect the grease line in the process.
- Remove the set collar from the drive shaft and slide the bearing assembly off the shaft. (See fig. 5.8.G2).

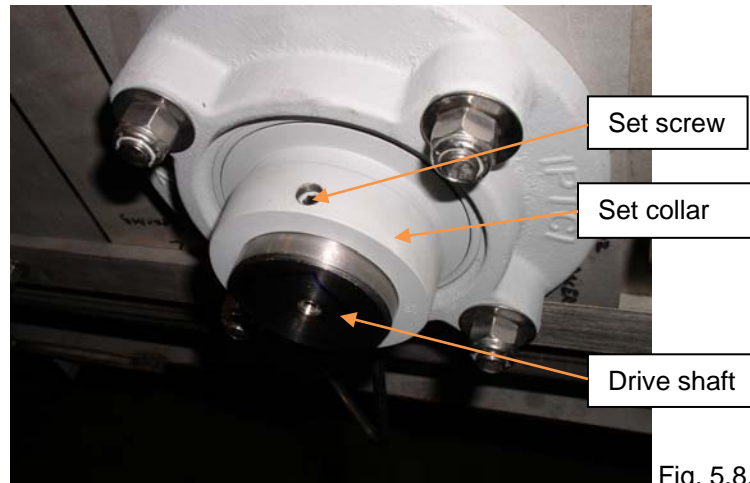


Fig. 5.8.G2

- Remove the bearing from the slide plate and replace with a new bearing.
- Mount the new bearing by performing these steps in reverse order.
- Check the chain tension after removing the supports.

G. Replacing the Gear Reducer

Perform the following steps to replace the gear reducer: (See Fig. 5.8.H1)

- Support the drive shaft from inside the machine to prevent it from falling.
- Separate the tension slide plate from the adjustment angle by unbolting the adjustment rod.
- Remove the motor from the gear box. Make sure power is disconnected from the motor.
- Remove the slide plate from the frame by unbolting the sliders.

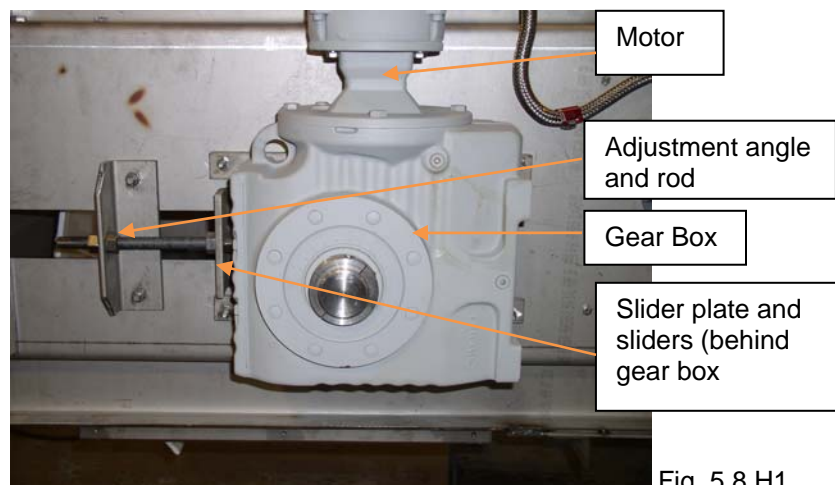


Fig. 5.8.H1

- Remove the set collar from the drive shaft and slide the gear box off the shaft. (See Fig. 5.8.H2).

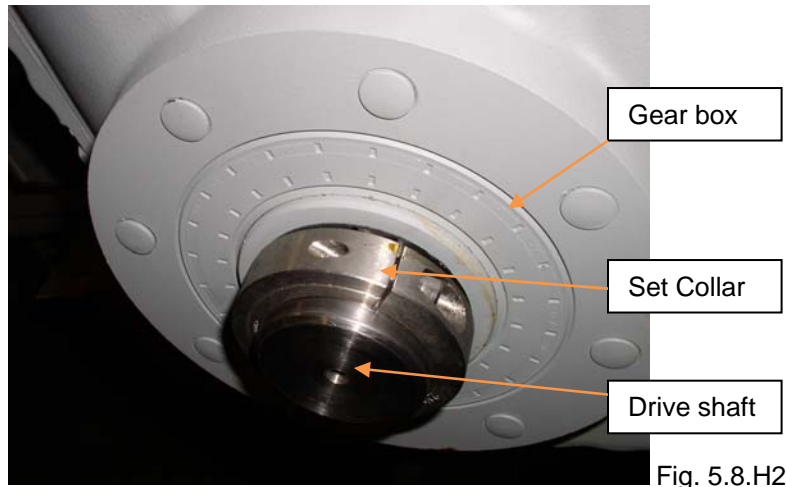


Fig. 5.8.H2

- Remove the gear box from the slide plate and replace with a new gear reducer.
- Mount the new gear reducer by performing these steps in reverse order.

H. Removing the Lower Journal

To replace the Lower Journal, perform the following steps:

- Release the chain tension as described in 5.7.B of this section.
- Slip the chain off of the journal.
- Remove the bolts that hold the cover plate to the journal and the bolts that hold the journal to the frame and backup flange. (See Fig. 5.8.J)

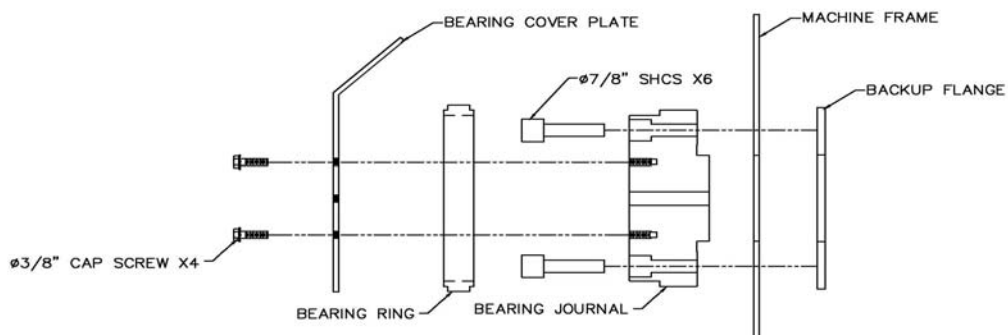


Fig. 5.8.J

I. Replacing the Bearing Ring

- Remove the journal as described previously.
- Using a mallet and punch, carefully remove the bearing ring without damaging the journal.
- Thoroughly degrease and sanitize the journals. Make sure the mating surface for the bearing is clean and dry.
- Heat the new bearing rings in hot water. Bring the water to 140° F and then add the rings to the water for 10 to 15 minutes.



DANGER! Extreme heat is being used. The parts will be very hot to touch. Use proper protection when handling the bearing rings.

- While the rings are still hot and malleable, place them on the journal. The rings should easily slide onto the journal and upon cooling, tighten around the journal.
- Replace the journal onto the frame and reattach the chain and cover plate.
- Perform a few test runs of the system before reinstating the machine back to service.

J. Replacing the Lower Sprocket

To replace the bearings and the lower sprockets, perform the following steps:

- Release the chain tension as described in 5.7.B of this section.
- Slip the chain off of the sprocket.
- Remove the bolts that hold the center cap to the spindle and the bolts that hold the spindle to the machine frame. (See Fig. 5.8.L)
- Slip the bearings, bushing and sprocket off of the spindle.
- Inspect the bearings and bushing and replace worn parts.
- Lubricate and reassemble as shown in Fig 5.8.L

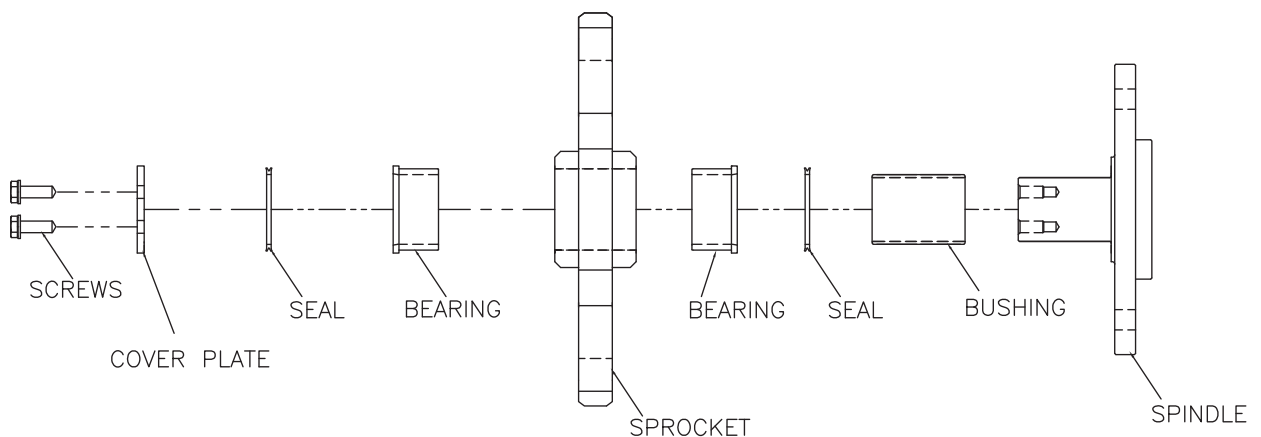


Fig. 5.8.L

- Mount the spindle onto the frame.

- Replace the chain onto the sprocket and reset the chain tension.

5.9 Mechanical Troubleshooting Reference

The following table is a list of possible common machine faults, symptoms and remedies for fixing. These items listed here are only for mechanical issues. For issues with the control system or electrical malfunctions refer to SECTION 7: Electrical Controls.

| Problem | Possible Causes | Solutions |
|---|---|---|
| Multi-rake screen does not start | No power to the motor* | Check all contacts and connections on terminal boxes, junction boxes and main control panel |
| | Faulty motor | Replace the motor |
| | Control malfunction | Check control settings |
| | | check signal to drive unit |
| | Downstream units not operational | Make sure units are operational |
| Noises | Bulky material jammed between screen bars | Remove objects |
| | Bulky material jammed in the vicinity of discharge hopper | Remove objects |
| | Rake teeth bent | Replace teeth |
| | Damaged bearings in gearbox | Inspect gearbox for damage and replace or repair if needed |
| | Worn or damaged bearings on the drive shaft | Inspect drive system and replace or repair as needed |
| | Overload relay has deactivated the drive motor | Bulky material jammed between screen bars |
| | Obstruction at bottom of channel | Remove obstruction |
| Screenings are not being fully scraped away | Wiper has solids stuck on it | Clean wiper |
| | Wiper plate is worn or damaged | Replace wipers |
| | Bulky material is jammed in discharge area and prevents wiper assembly from full motion | Remove objects |

*Refer to SECTION 7: Electrical Controls for more detailed information on this subject.



Section 6 Parts Lists & Vendor Data

6 Parts Lists & Vendor Data

At Vulcan Industries we do our best to service all our machinery in the most expedited manner. If you require replacement parts for your machine, you can contact our service department at:

Vulcan Industries
212 S. Kirlin St.
Missouri Valley, IA 51555
712-642-2755

Or email at service@vulcanindustries.com

Normal hours of operation are Monday-Friday 8 A.M. to 5 P.M. central.

Make sure to provide the following information located on the cover page of this manual:

- The Vulcan Job Number.
- The project or facility name.
- The project or facility location (city & state).
- Machine Model Number.

Also provide any drawing numbers that you are referencing for your part numbers. If you are using the assembly drawings provided on the following pages, use the drawing numbers listed in the upper right corner of the drawing for reference.

All of this information will help us expedite the correct replacement parts for your machine. Thank you.

6.1 Assembly Drawings

The following drawings reference the working components of the multi-rake machine and are to be used when ordering replacement parts.



Section 6 Parts Lists & Vendor Data

A. Drive System

ASSEMBLY DWG. 6.1.1 DRIVE SYSTEM

| P/N | QTY | PART-DESCRIPTION |
|-----|---------|----------------------------------|
| P1 | 1 | DRIVE MOTOR & GEARBOX |
| P2 | 2 | CHAIN TENSION SYSTEM |
| P3 | AS REQD | DRIVE CHAIN |
| P4 | 1 | DRIVE SHAFT |
| P5 | 2 | UPPER DRIVE SPROCKET |
| P6 | 1 | FLANGE BEARING W/ SET SCREW LOCK |



Section 6 Parts Lists & Vendor Data

B. Rake Assembly

ASSEMBLY DWG. 6.1.2 RAKE ASSY

| P/N | QTY | PART-DESCRIPTION |
|-----|----------|--------------------------|
| P1 | 1 | RAKE TEETH |
| P2 | 5 | RAKE TEETH HARDWARE |
| P3 | 1 | RAKE SHELF |
| P4 | AS REQ'D | FOLLOWER ROLLER HARDWARE |
| P5 | AS REQ'D | LEAD ROLLER HARDWARE |
| P6 | AS REQ'D | SPACER |

C. Wiper Assembly

ASSEMBLY DWG. 6.1.3 WIPER ASS'Y

SEE PROXIMITY SWITCH DETAIL

FRAME REMOVED FOR CLARITY

PROXIMITY SWITCH DETAIL

| P/N | QTY | PART-DESCRIPTION |
|-----|--------|-------------------------------------|
| P1 | 1 | WIPER ASSEMBLY |
| P2 | 1 | UHMW WIPER BLADE |
| P3 | VARIES | FLAT HEAD BOLTS |
| P4 | 2 | WIPER BEARING |
| P5 | 1 | WIPER SHOCK |
| P6 | 1 | PROXIMITY SWITCH ADJUSTMENT BRACKET |
| P7 | 1 | PROXIMITY SWITCH ASSEMBLY |
| P/N | QTY | PART-DESCRIPTION |



Section 6 Parts Lists & Vendor Data

D. Journal Bearing Assembly

ASSEMBLY DWG. 6.1.4 JOURNAL BEARING ASSY

| P/N | QTY | PART-DESCRIPTION |
|-----|-----|---------------------|
| P1 | 1 | JOURNAL |
| P2 | 6 | #7/8 SHCS |
| P3 | 1 | BEARING RING |
| P4 | 1 | BEARING COVER PLATE |
| P5 | 4 | #3/8 CAP SCREWS |



Section 6 Parts Lists & Vendor Data

E. Recommended Spare Parts per Screen

| Part Description | Quantity |
|--------------------------------|-----------------|
| Wiper blades | Four (4) |
| 5 Foot sections of drive chain | Four (4) |
| Proximity switches | Four (4) |

For a list of spare parts included with your contract refer to Section 8: Project Data, 8.2 Project Specifications, 2.17 of your VMR O & M manual.



Section 6 Parts Lists & Vendor Data

6.2 Drive Motor and Gear Data

VULCAN INDUSTRIES, INC.

Device 1

Job No. 19177 Form #: 4.4.11
 Job Name Wichita KS. Date of test: 1/3/2020
 Equipment Type VMR-48
 Equipment Serial No. 19177-450-1
 Tagged BSC-1

 Description of test: **In Shop Factory Test**
Motor Nameplate Data

| | | | | |
|------------|-----------------|------|-----------|-------|
| Mfg. | Baldor-Reliance | | | |
| Serial No. | F1903071530 | | | |
| CAT No. | 1DXM7542T | | | |
| Spec. # | 06J010X181G2 | | | |
| No. | D10140742 | | | |
| Frame | Type | Code | Design | Class |
| 182TC | C1/D1 | T2B | B | F |
| Encl. | H.P. | PH. | HZ | RPM |
| | 3 | 3 | 60 | 1755 |
| S.F. | VOLTS | | AMPS | |
| 1 | 230 / 460 | | 8.2 / 4.1 | |
| DE brg | | | | |
| ODE brg | | | | |

Reducer Nameplate Data

| | |
|------------------|--------------------------|
| Mfg. | SEW-Eurodrive |
| Serial No. | 87.7803639201.0003.19.50 |
| Type | SA97/TAM182 |
| Mount | M1A |
| Oil Capacity | 7.0 liter |
| T ₂ = | 35,400 |
| N ₂ = | |
| I (ratio) = | 262.22 |
| SF | |

Brake Nameplate Data

| | |
|---------------|--|
| Mfg. | |
| Serial No. | |
| Model No. | |
| Ft lbs torque | |
| Voltage | |

Test Remarks

| | | |
|----------------------------------|-----|-----|
| Reducer vent plug installed | Y | N |
| Oil level confirmed | Y | N |
| All lubrication completed | Y | N |
| Adjustment required | Y | N |
| Operated with designed controls | Y | N |
| Video taped operation | Y | N |
| Control panel verified | Y | N |
| 8 hr run test completed | Y | N |
| Screen hour meter start / finish | 0.5 | 8.5 |

Testing Equipment:

| | | |
|-----------------------|------------|---------------------|
| Test Device 1: | Serial No. | Date of Calibration |
| Fluke 333 Clamp Meter | 79610273 | 7/24/2020 |
| Test Device 2: | Serial No. | Date of Calibration |
| Fluke 65 Thermometer | 95600311 | 7/13/2020 |

Voltage Reading Phase to Phase:

| L1-L2 | L1-L3 | L2-L3 | Motor Temp. Rise | Reducer Temp. Rise |
|-------|-------|-------|------------------|--------------------|
| 482 | 476 | 486 | 66 | at start up |
| | | | 72 | 15 min. |
| | | | 76 | 30 min |
| | | | 81 | 1 hr. |
| | | | 83 | 2 hr. |
| | | | 83 | 3 hr. |
| | | | 84 | 4 hr. |
| | | | 84 | 5 hr. |
| | | | 84 | 6 hr. |
| | | | 85 | 7 hr. |
| | | | 85 | 8 hr. |

TEST REMARKS:

Went over control panel operation with technician, verifying complete operation.
 Connected control panel to equipment and verified operation between the two pieces of equipment
 Ran equipment for period of 8 hours monitoring amps, voltage, and temperature of both motor and gear box.

VULCAN INDUSTRIES, INC.

Device 1

Job No. 19177 Form #: 4.4.11
 Job Name Wichita KS. Date of test: 1/3/2020
 Equipment Type VMR-48
 Equipment Serial No. 19177-435-2
 Tagged BSC-2

 Description of test: **In Shop Factory Test**
Motor Nameplate Data

| | | | | |
|------------|-----------------|------|-----------|-------|
| Mfg. | Baldor-Reliance | | | |
| Serial No. | F1906073400 | | | |
| CAT No. | 1DXM7542T | | | |
| Spec. # | 06J010X181G2 | | | |
| No. | D48513888 | | | |
| Frame | Type | Code | Design | Class |
| 182TC | C1/D1 | T2B | B | F |
| Encl. | H.P. | PH. | HZ | RPM |
| | 3 | 3 | 60 | 1755 |
| S.F. | VOLTS | | AMPS | |
| 1 | 230 / 460 | | 8.2 / 4.1 | |
| DE brg | | | | |
| ODE brg | | | | |

Reducer Nameplate Data

| | |
|------------------|--------------------------|
| Mfg. | SEW-Eurodrive |
| Serial No. | 87.7803639201.0004.19.50 |
| Type | SA97/TAM182 |
| Mount | M1A |
| Oil Capacity | 7.0 liter |
| T ₂ = | 35,400 |
| N ₂ = | |
| I (ratio) = | 262.22 |
| SF | |

Brake Nameplate Data

| | |
|---------------|--|
| Mfg. | |
| Serial No. | |
| Model No. | |
| Ft lbs torque | |
| Voltage | |

Test Remarks

| | | |
|----------------------------------|-----|---|
| Reducer vent plug installed | Y | N |
| Oil level confirmed | Y | N |
| All lubrication completed | Y | N |
| Adjustment required | Y | N |
| Operated with designed controls | Y | N |
| Video taped operation | Y | N |
| Control panel verified | Y | N |
| 8 hr run test completed | Y | N |
| Screen hour meter start / finish | 0.9 | 9 |

Testing Equipment:

| | | |
|-----------------------|------------|---------------------|
| Test Device 1: | Serial No. | Date of Calibration |
| Fluke 333 Clamp Meter | 79610273 | 7/24/2020 |
| Test Device 2: | Serial No. | Date of Calibration |
| Fluke 65 Thermometer | 95600311 | 7/13/2020 |

Voltage Reading Phase to Phase:

| L1-L2 | L1-L3 | L2-L3 | Motor Temp. Rise | Reducer Temp. Rise |
|-------|-------|-------|------------------|--------------------|
| 482 | 473 | 486 | 66 | at start up |
| | | | 72 | 15 min. |
| | | | 77 | 30 min |
| | | | 81 | 1 hr. |
| | | | 83 | 2 hr. |
| | | | 84 | 3 hr. |
| | | | 85 | 4 hr. |
| | | | 84 | 5 hr. |
| | | | 84 | 6 hr. |
| | | | 84 | 7 hr. |
| | | | 84 | 8 hr. |

TEST REMARKS:

Went over control panel operation with technician, verifying complete operation.
 Connected control panel to equipment and verified operation between the two pieces of equipment
 Ran equipment for period of 8 hours monitoring amps, voltage, and temperature of both motor and gear box.

VULCAN INDUSTRIES, INC.

Device 1

Job No. 19177 Form #: 4.4.11
 Job Name Wichita KS. Date of test: 1/21/2020
 Equipment Type VMR-48
 Equipment Serial No. 19177-450-3
 Tagged BSC-3

 Description of test: **In Shop Factory Test**
Motor Nameplate Data

| | | | | |
|------------|-----------------|------|-----------|-------|
| Mfg. | Baldor-Reliance | | | |
| Serial No. | F1903071535 | | | |
| CAT No. | 1DXM7542T | | | |
| Spec. # | 06J010X181G2 | | | |
| No. | D10140743 | | | |
| Frame | Type | Code | Design | Class |
| 182TC | C1/D1 | T2B | B | F |
| Encl. | H.P. | PH. | HZ | RPM |
| | 3 | 3 | 60 | 1755 |
| S.F. | VOLTS | | AMPS | |
| 1 | 230 / 460 | | 8.2 / 4.1 | |
| DE brg | | | | |
| ODE brg | | | | |

Reducer Nameplate Data

| | |
|------------------|--------------------------|
| Mfg. | SEW-Eurodrive |
| Serial No. | 87.7803639201.0001.19.50 |
| Type | SA97/TAM182 |
| Mount | M1A |
| Oil Capacity | 7.0 liter |
| T ₂ = | 35,400 |
| N ₂ = | |
| I (ratio) = | 262.22 |
| SF | |

Brake Nameplate Data

| | |
|---------------|--|
| Mfg. | |
| Serial No. | |
| Model No. | |
| Ft lbs torque | |
| Voltage | |

Test Remarks

| | | |
|----------------------------------|-----|-----|
| Reducer vent plug installed | Y | N |
| Oil level confirmed | Y | N |
| All lubrication completed | Y | N |
| Adjustment required | Y | N |
| Operated with designed controls | Y | N |
| Video taped operation | Y | N |
| Control panel verified | Y | N |
| 8 hr run test completed | Y | N |
| Screen hour meter start / finish | 0.5 | 8.6 |

Testing Equipment:

| | | |
|-----------------------|------------|---------------------|
| Test Device 1: | Serial No. | Date of Calibration |
| Fluke 333 Clamp Meter | 79610273 | 7/24/2020 |
| Test Device 2: | Serial No. | Date of Calibration |
| Fluke 65 Thermometer | 95600311 | 7/13/2020 |

Voltage Reading Phase to Phase:

| L1-L2 | L1-L3 | L2-L3 | Motor Temp. Rise | Reducer Temp. Rise |
|--------------------------|-------|-------|------------------|--------------------|
| 478 | 490 | 491 | 68 | 66 |
| | | | at start up | |
| Motor Amp Reading | | | 76 | 71 |
| T1 | T2 | T3 | 79 | 74 |
| 2.1 | 2 | 2.1 | 83 | 79 |
| | | | 86 | 87 |
| | | | 85 | 91 |
| | | | 85 | 92 |
| | | | 84 | 92 |
| | | | 84 | 94 |
| | | | 84 | 95 |
| | | | 84 | 95 |

TEST REMARKS:

Went over control panel operation with technician, verifying complete operation.
 Connected control panel to equipment and verified operation between the two pieces of equipment
 Ran equipment for period of 8 hours monitoring amps, voltage, and temperature of both motor and gear box.

VULCAN INDUSTRIES, INC.

Device 1

Job No. 19177 Form #: 4.4.11
 Job Name Wichita KS. Date of test: 1/21/2020
 Equipment Type VMR-48
 Equipment Serial No. 19177-435-4
 Tagged BSC-4

 Description of test: **In Shop Factory Test**
Motor Nameplate Data

| | | | | |
|------------|-----------------|------|-----------|-------|
| Mfg. | Baldor-Reliance | | | |
| Serial No. | F1903071560 | | | |
| CAT No. | 1DXM7542T | | | |
| Spec. # | 06J010X181G2 | | | |
| No. | D10140748 | | | |
| Frame | Type | Code | Design | Class |
| 182TC | C1/D1 | T2B | B | F |
| Encl. | H.P. | PH. | HZ | RPM |
| | 3 | 3 | 60 | 1755 |
| S.F. | VOLTS | | AMPS | |
| 1 | 230 / 460 | | 8.2 / 4.1 | |
| DE brg | | | | |
| ODE brg | | | | |

Reducer Nameplate Data

| | |
|------------------|--------------------------|
| Mfg. | SEW-Eurodrive |
| Serial No. | 87.7803639201.0002.19.50 |
| Type | SA97/TAM182 |
| Mount | M1A |
| Oil Capacity | 7.0 liter |
| T ₂ = | 35,400 |
| N ₂ = | |
| I (ratio) = | 262.22 |
| SF | |

Brake Nameplate Data

| | |
|---------------|--|
| Mfg. | |
| Serial No. | |
| Model No. | |
| Ft lbs torque | |
| Voltage | |

Test Remarks

| | | |
|----------------------------------|-----|-----|
| Reducer vent plug installed | Y | N |
| Oil level confirmed | Y | N |
| All lubrication completed | Y | N |
| Adjustment required | Y | N |
| Operated with designed controls | Y | N |
| Video taped operation | Y | N |
| Control panel verified | Y | N |
| 8 hr run test completed | Y | N |
| Screen hour meter start / finish | 0.5 | 8.6 |

Testing Equipment:

| | | |
|-----------------------|------------|---------------------|
| Test Device 1: | Serial No. | Date of Calibration |
| Fluke 333 Clamp Meter | 79610273 | 7/24/2020 |
| Test Device 2: | Serial No. | Date of Calibration |
| Fluke 65 Thermometer | 95600311 | 7/13/2020 |

Voltage Reading Phase to Phase:

| L1-L2 | L1-L3 | L2-L3 | Motor Temp. Rise | Reducer Temp. Rise |
|-------|-------|-------|------------------|--------------------|
| 478 | 489 | 492 | 68 | at start up |
| | | | 75 | 15 min. |
| | | | 80 | 30 min |
| | | | 84 | 1 hr. |
| | | | 87 | 2 hr. |
| | | | 87 | 3 hr. |
| | | | 87 | 4 hr. |
| | | | 86 | 5 hr. |
| | | | 86 | 6 hr. |
| | | | 86 | 7 hr. |
| | | | 86 | 8 hr. |

TEST REMARKS:

Went over control panel operation with technician, verifying complete operation.
 Connected control panel to equipment and verified operation between the two pieces of equipment
 Ran equipment for period of 8 hours monitoring amps, voltage, and temperature of both motor and gear box.

BALDOR® • RELIANCE

Product Information Packet

DXP INDUSTRIES

IDXM7542T

3HP, 1755RPM, 3PH, 60HZ, 182TC, 0632M, XPFC, F1

| Part Detail | | | | | | | |
|-------------|-------|----------------|-------|-------------|----------|---------------|------------|
| Revision: | E | Status: | PRD/A | Change #: | | Proprietary: | No |
| Type: | AC | Prod. Type: | 0632M | Elec. Spec: | 06WGX181 | CD Diagram: | CD0005 |
| Enclosure: | XPFC | Mfg Plant: | | Mech. Spec: | 06J010 | Layout: | 06LYJ010 |
| Frame: | 182TC | Mounting: | F1 | Poles: | 04 | Created Date: | 12-21-2011 |
| Base: | RG | Rotation: | R | Insulation: | F | Eff. Date: | 08-19-2013 |
| Leads: | 9#16 | | | | | Replaced By: | |
| Literature: | | Elec. Diagram: | | | | | |

| Nameplate NP0890XPSL | | | | | | | |
|----------------------|--------------|------------|--------------|----------|-----|----------|------|
| NO. | | CC | 010A | | | | |
| S/N | | TEMP CODE | T2B | | | | |
| SPEC. | 06J010X181G2 | INV.TYPE | PWM | | | | |
| CAT.NO. | IDXM7542T | C HP FR | 60 | C HP TO | 90 | | |
| HP | 3 | CT HZ FROM | 6 | CT HZ TO | 60 | | |
| VOLTS | 230/460 | VT HZ FROM | 6 | VT HZ TO | 60 | | |
| AMPS | 8.2/4.1 | MAG CUR | 4.2/2.1 | | | | |
| RPM | 1755 | MX RPM | 2700 | | | | |
| HZ | 60 | PH | 3 | CL | F | NOM.EFF. | 89.5 |
| SER.F. | 1.00 | DES | B | SL HZ | 1.5 | WK2 | 0.3 |
| FRAME | 182TC | RATING | 40C AMB-CONT | | | | |
| | | | | | | | |
| | 75C RISE | | | | | | |

| Parts List | | |
|---------------|--|----------|
| Part Number | Description | Quantity |
| SA236472 | SA 06J010X181G2 | 1.000 EA |
| RA223419 | RA 06J010X181G2 | 1.000 EA |
| 36FN3000C01SP | EXFN, PLASTIC, 5.25 OD, .912 ID | 1.000 EA |
| HW3201A05 | 3/8-16 EYEBOLT | 1.000 EA |
| 07CB1000A02 | CONDUIT BOX, MODEL 306,EXP. PROOF | 1.000 EA |
| 10XN2520A12 | O1/4-20X 3/4 HEX HEAD CAP | 4.000 EA |
| HW1001A25 | LOCKWASHER 1/4, ZINC PLT .493 OD, .255 I | 4.000 EA |
| WD1000B17 | T&B CX35TN TERMINAL | 1.000 EA |
| 11XW1032G06 | 10-32 X .38, TAPTITE II, HEX WSHR SLTD U | 1.000 EA |
| HW4500A19 | 1/4-28X1/4 SLOTTED PLUG F/S | 2.000 EA |
| 06EP1706A01 | SPECIAL FRONT ENDPLATE X06M - TEFC | 1.000 EA |
| 10XN3118K20 | 5/16-18 X 1 1/4 GRADE 5 STEEL ZC PLATED | 4.000 EA |
| HW1001A31 | LOCKWASHER 5/16, ZINC PLT.591 OD, .319 I | 4.000 EA |
| HW5100A05 | WVY WSHR F/205 & 304 BRGS | 1.000 EA |
| 06EP1707A01 | STD XP PU EP 182-4TC 206 BRG 306M | 1.000 EA |
| 51XN1032A20 | 10-32 X 1 1/4 HX WS SL SR | 2.000 EA |
| HW4001A01 | 1/4 HX SOC PIPE PLG (F/S) ALLOY STEEL W/ | 2.000 EA |
| 60XN1032A07 | 10-32 X 1/2 TRUSS HEAD, TORX SERRATED ZN | 2.000 EA |
| 10XN3118K20 | 5/16-18 X 1 1/4 GRADE 5 STEEL ZC PLATED | 4.000 EA |
| HW1001A31 | LOCKWASHER 5/16, ZINC PLT.591 OD, .319 I | 4.000 EA |
| 06FH1003A01 | FAN COVER, CAST X-PROOF--MACHINING | 1.000 EA |
| 51XN1032A14 | 10-32 X 0.875 HX WS SL SR | 4.000 EA |
| 07CB1500A01 | CONDUIT BOX LID MACH | 1.000 EA |
| 10XN2520A16 | 1/4-20 X 1 HEX HEAD CAP SCR, ZINC PLATED | 4.000 EA |

| Parts List (continued) | | |
|------------------------|--|----------|
| Part Number | Description | Quantity |
| HW1001A25 | LOCKWASHER 1/4, ZINC PLT .493 OD, .255 I | 4.000 EA |
| HW2501E16 | 3KEY, 1/4 SQ X 1.750 | 1.000 EA |
| HA7000A02 | KEY RETAINER RING, 1 1/8 DIA, 1 3/8 DIA | 1.000 EA |
| LB1081 | ALUM XP CAUTION LABEL | 1.000 EA |
| LB1115 | LABEL,LIFTING DEVICE | 1.000 EA |
| 85XU0407S04 | 4X1/4 U DRIVE PIN STAINLESS | 6.000 EA |
| MJ1000A75 | GREASE, POLYREX EM EXXON (USe 4824-15A) | 0.050 LB |
| 51XB1214A16 | 12-14X1.00 HXWSSLD SERTYB | 1.000 EA |
| MG1025G29 | MUNSELL 4.5Y 5.3/0.7 DARK CHARCOAL GREY | 0.028 GA |
| MG1025Z20 | ACTIVATOR WILKOFAS 060.32 | 0.010 GA |
| LB1119 | WARNING LABEL | 1.000 EA |
| LB1125C01 | STD (STOCK) CARTON LABEL BALDOR WITH FLA | 1.000 EA |
| LC0145B01 | CONNECTION LABEL | 1.000 EA |
| NP0890XPSL | SS XP INV UL CSA CC CL-I GP-D | 1.000 EA |
| G0PA1000 | SPCL PACKAGING | 1.000 EA |
| LB1506 | LABEL "AMERICAN MADE" 1.50 X 1.00 | 1.000 EA |
| MN416A01 | TAG-INSTAL-MAINT no wire. (100/bx) 8/12 | 1.000 EA |



AC Induction Motor Performance Data
 Record # 36483
 Typical performance - not guaranteed values

| | | |
|--------------------------|--------------------|------------------------|
| Winding: 06WGX181 | Type: 0632M | Enclosure: TEBC |
|--------------------------|--------------------|------------------------|

| Nameplate Data | | | | General Characteristics at 460 V, 60 Hz: High Volt Connection | |
|-------------------|--------------|----------|----|--|------------|
| Rated Output (HP) | 3 | | | Full Load Torque | 9.06 LB-FT |
| Volts | 230/460 | | | Start Configuration | DOL |
| Full Load Amps | 8.2/4.1 | | | Break Down Torque | 33.1 LB-FT |
| R.P.M. | 1755 | | | Pull-Up Torque | 18.2 LB-FT |
| Hz | 60 | Phase | 3 | Locked-rotor Torque | 20.4 LB-FT |
| NEMA Design Code | B | KVA Code | J | Starting Current | 29.8 Amps |
| Service Factor | 1 | | | No-load Current | 2.14 Amps |
| NEMA Nom. Eff. | 89.5 | P.F. | 77 | Line-line Res. @ 25°C. | 3.94 Ohms |
| Rating - Duty | 40C AMB-CONT | | | Temp. Rise @ Rated Load | 35°C |
| S.F. Amps | | | | Temp. Rise @ S.F. Load | |

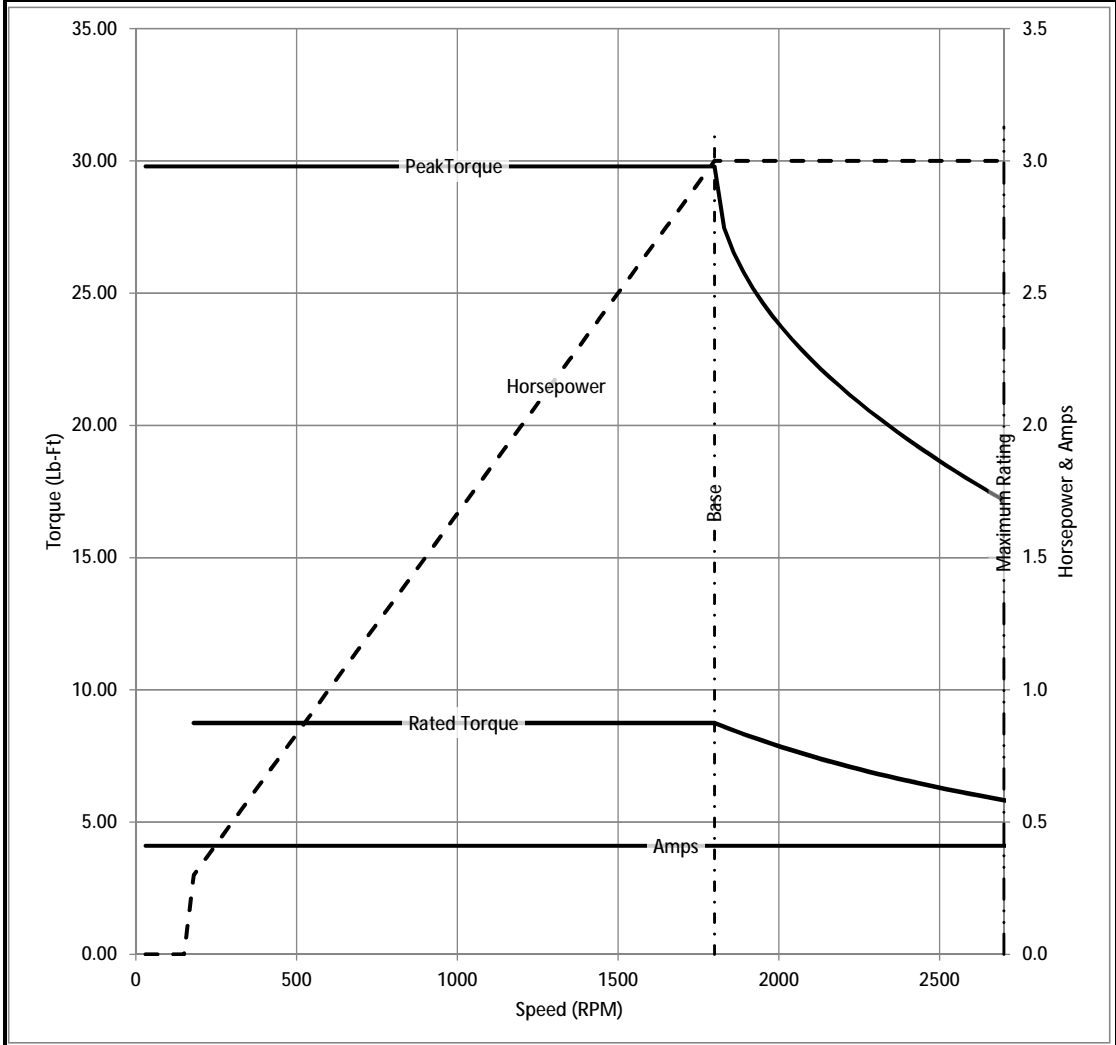
Load Characteristics at 460 Volts, 60 Hz, 3 HP

| % of Rated Load | 25 | 50 | 75 | 100 | 125 | 150 | S.F. |
|-----------------|------|------|------|------|------|------|------|
| Power Factor | 38 | 58 | 70 | 77 | 81 | 83 | |
| Efficiency | 83.2 | 88.3 | 89.8 | 89.7 | 89.1 | 87.7 | |
| Speed | 1790 | 1779 | 1769 | 1757 | 1744 | 1730 | |
| Line Amperes | 2.34 | 2.79 | 3.39 | 4.1 | 4.91 | 5.86 | |

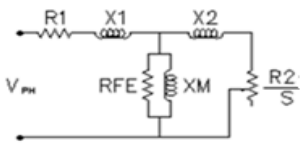
Baldor Electric Company Fort Smith, Arkansas



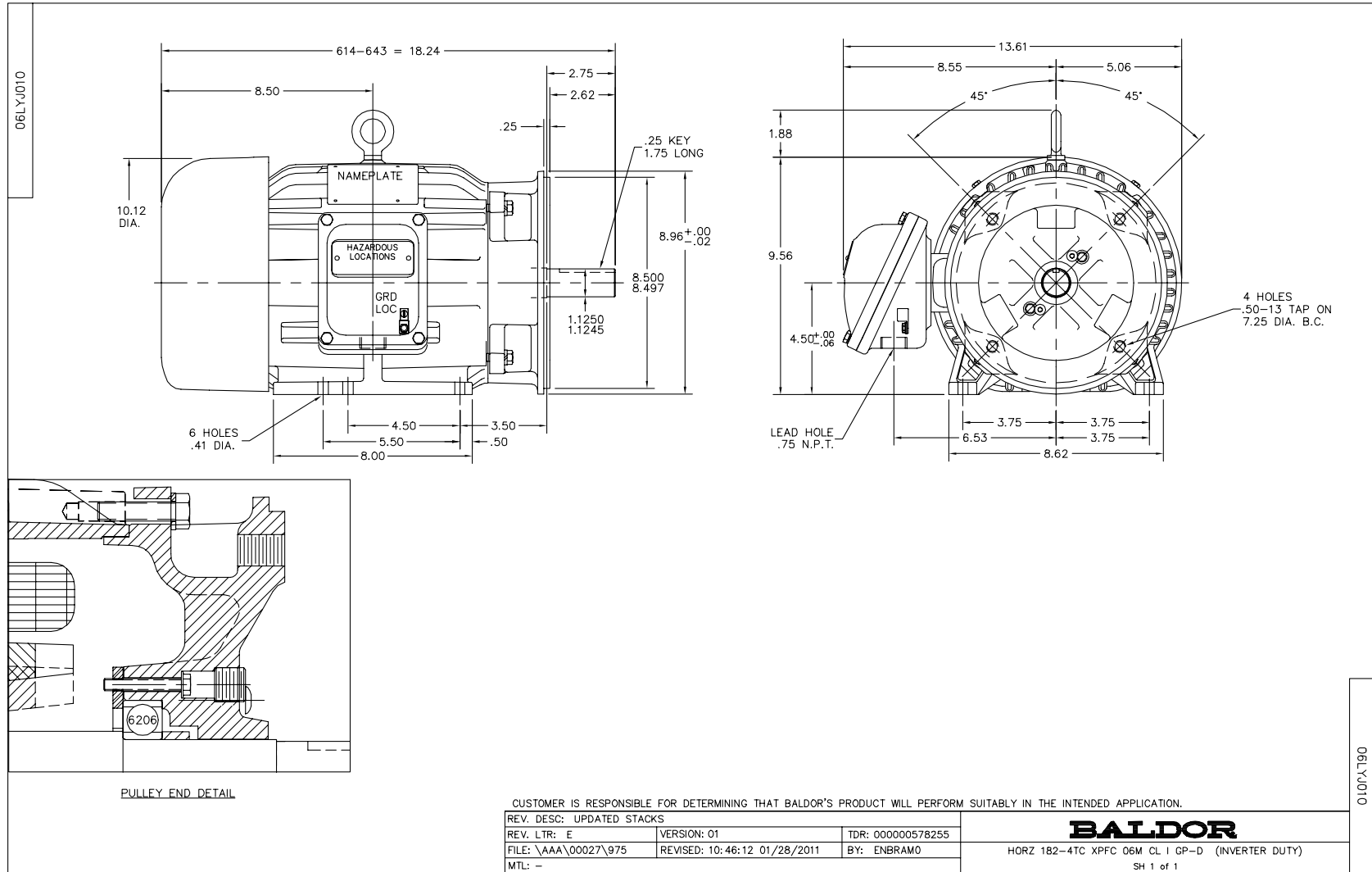
| | | | | | | | | | |
|------------|-----------|--------------------------|---------|---------------------------------------|-------|---|-------|----|---------|
| Catalog | IDXM7542T | NP VOLTS | 230/460 | ENCLOSURE | XPFC | WYE CONN EQ CKT OHMS PER PHASE (BASE RATING, 20C) | | | |
| FRAME | 182TC | NP AMPS | 8.2/4.1 | Base Volts | 460 | R1 | 1.930 | X1 | 5.490 |
| HP | 3 HP | DUTY | Cont | Base AMPS | 4.1 | R2 | 1.370 | X2 | 4.581 |
| BASE SPEED | 1800 | MAX SAFE RPM | 2700 | Slip Hz | 1.43 | | | XM | 119.333 |
| PHASE/HZ | 3/60 | AMB ⁰ C/INSUL | 40/F | WK ² (lb-ft ²) | 0.298 | | | | |



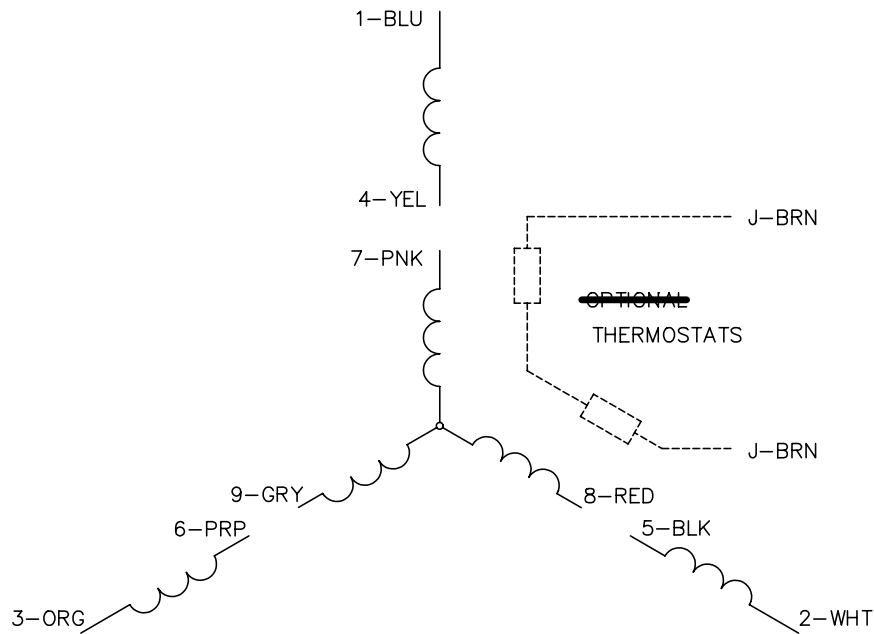
Remarks: Calculated Data



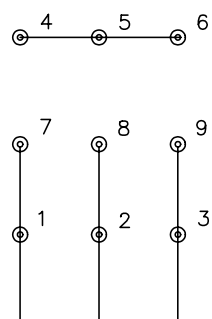
| | | | |
|--|--------|-----------|--|
| | DR BY | ENR | 06J010X181G2 A-C MOTOR PERFORMANCE CURVES ISSUE DATE 2/27/2013 |
| | CK BY | | |
| | APP BY | ENR | |
| | DATE | 2/27/2013 | |



CD0005

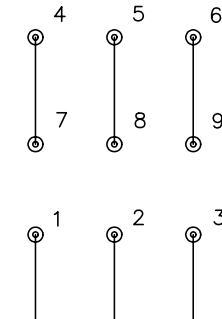


LOW VOLTAGE
(2Y)



LINE

HIGH VOLTAGE
(1Y)



LINE

NOTES:

1. INTERCHANGE ANY TWO LINE LEADS TO REVERSE ROTATION.
2. OPTIONAL THERMOSTATS ARE PROVIDED WHEN SPECIFIED.
3. ACTUAL NUMBER OF INTERNAL PARALLEL CIRCUITS MAY BE A MULTIPLE OF THOSE SHOWN ABOVE.
4. LEAD COLORS ARE OPTIONAL. LEADS MUST ALWAYS BE NUMBERED AS SHOWN.

| | | | |
|---|---------|-------------------------|--------------|
| REV. DESC: REVISE TO SHOW OPTIONAL COLORS | | | |
| REV. LTR: E | BY: JLP | REVISED: 01/19/99 10:15 | TDR: 0171435 |
| 900000 | | FILE: AAA00005140 | MDL: - |
| | | MTL: - | |

BALDOR ELECTRIC Co.

3PH, DV, 9 LEADS

CD0005



S..AD..



SA..AD..

General Information

Introduction

The SEW-Eurodrive Helical-Worm Gear Units are designed for continuous duty under difficult operating conditions. Only materials of the highest quality are used in the manufacture of the units. These units have the following standard construction features:

- Gearcase and flanges of high strength gray cast iron SAE Class 30.
- Double seals on output shafts with additional inner seal made of Viton®.
- Captured keys on input and output shafts.
- Foot mounted, flange mounted, flange mounted with hollowshaft, or shaft mounted.

Efficiency

The efficiency of the gear units is mostly determined by the gearing and bearing friction, and ranges up to approximately 92%. However, due to the sliding friction of the worm gearing, the actual efficiency depends upon the gear ratio of the worm stage and the input speed.

The helical-worm gear units have an input helical gear stage which reduces the ratio of the worm gear stage and as a result improves the overall efficiency as compared to a gear unit with a worm gear only.

The rated efficiencies are achieved if the gear unit has been correctly run in, has achieved its nominal operating temperature, has the proper lubrication, and is operating within its torque rating.

Backdriving

With respect to torque driving back from the output shaft, the backdriving efficiency η_{21} is far less favorable than the forward efficiency η_{12} and may need to be taken into account.

The low backdriving efficiency may provide some braking effect in certain instances but since the actual efficiency is dependent on many factors including ambient temperature and worm speed, we request you submit full details to our engineering department if this braking effect is required.

Since the SEW-Eurodrive Helical-Worm gear units have fairly high efficiency, they can not be considered as self-locking, and should not be used if the self-locking effect is required.

Input Power, Output Torque, and Speed

The details on power, torque, and speed given in the selection tables always refer to the mounting position B3 or similar mounting position with standard features, standard ambient conditions, and standard lubricants. Depending upon ratio, increased output power ratings may be achieved through the use of special lubricants. Please consult your SEW-Eurodrive representative.

The output speeds have been rounded up or down. The actual output speed may vary slightly due to the motor frame size, the loading, or the supply voltage.

Design Variations

In addition to the versions shown in the accompanying pages, the Helical-Worm Gear Units are also available with the combination of double shaft, double flange or flange opposite shaft mount.

Additional features available for the Helical-Worm Gear units are:

- Adapters for IEC or NEMA C-Face motors.
- Motor mounting platforms and scoops.
- Adapters for torque limiting couplings.
- Corrosion protection.
- Torque arm attachment.
- Shrink disc shaft mounting.

Please contact your SEW-Eurodrive representative for additional information.

Abbreviations

The following abbreviations are used in the selection tables:

| | |
|-------------|--|
| f_B | Service Factor |
| F_{Ra} | Permissible output overhung load (lb) at the midpoint of the output shaft extension |
| F_{Re} | Permissible input overhung load (lb) at the midpoint of the input shaft extension |
| i | Gear unit ratio |
| i_w | Worm gear stage ratio |
| | Efficiency |
| n_a | Output speed in rpm |
| n_e | Input speed in rpm |
| P_a | Rated output power (Hp) |
| P_e | Calculated power input into the gear unit (Hp) |
| | P_e is calculated from $T_{a\max}$ by taking into account the gear units' efficiency under standard operating conditions. For calculated P_e less than .2Hp, a dash (—) is shown in the respective selection tables since the actual values are subject to large variations. |
| P_n | Motor rated power (HP) |
| T_a | Output torque (lb-in.) with reference to the driving motor |
| $T_{a\max}$ | Maximum permissible output torque (lb-in.) at $f_B = 1.0$ |

Dimension Page Notes

The dimension sheets are valid for standard units with various basic features. In particular, accessories such as platforms, scoops, etc. will alter the basic dimensions. Please refer to the respective accessory dimension pages for additional dimensions.

Certified dimension sheets are available from your SEW-Eurodrive Assembly Center.

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Service Factoring

Unit Selection

In order to select the most suitable gear unit it is essential that a thorough knowledge of the characteristics of the driven machine are known. The gear units are normally designed for constant torque load and only a few starts/stops. If these conditions do not exist, it is necessary to determine a service factor, f_B TOTAL, where f_B TOTAL = $f_B \times f_{B1} \times f_{B2}$

f_B Is determined by the start/stop frequency, Load Class, and the daily operating time.

f_{B1} Is determined by the ambient temperature.

f_{B2} Is determined by the cyclic duration factor.

f_B , f_{B1} , f_{B2} service factors are shown in the diagrams that follow.

For gearmotors, the appropriate service factor taken from the diagram is then compared with the service factor given with each speed/power combination listed in the gearmotor selection tables. To ensure a long, trouble free service life it is essential that the unit selected has a service factor equal to, or greater than, that determined from the diagram.

Load Classification

I = Uniform load. Permissible inertia acceleration factor 0.2

II = Moderate shock load. Permissible inertia acceleration factor 3.0

III = Heavy shock load. Permissible inertia acceleration factor 10

For inertia acceleration factor > 10, please contact your nearest SEW-Eurodrive representative.

$$\text{Inertia acceleration factor} = \frac{J_L}{J_m}$$

Where: J_L = Reflected Load Inertia
 J_m = Motor Inertia

All external load inertias, J, must be reflected back to the input side of the gear unit.

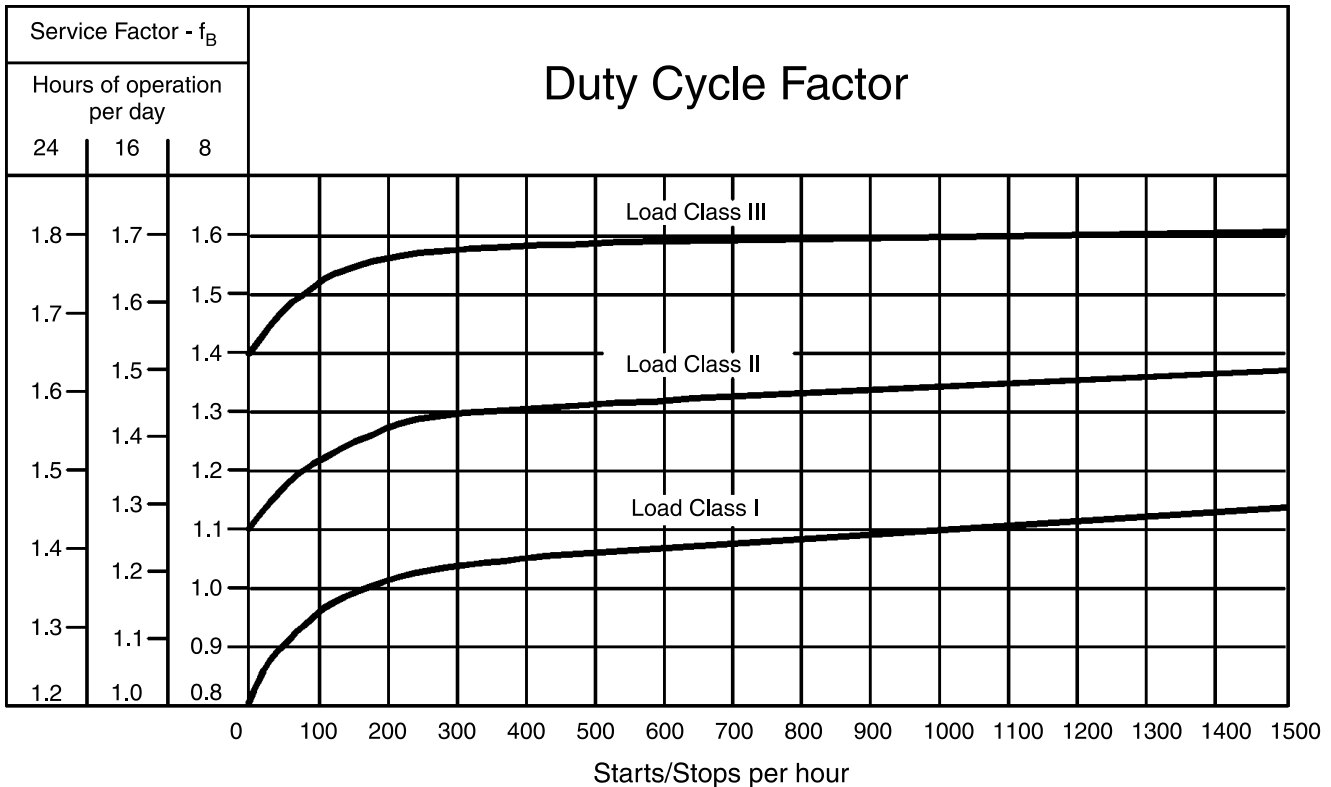
$$\text{Example: } J_L = J \frac{1}{(\text{Gear Ratio})^2}$$

Included in the number of starts and stops per hour must be all regenerative brake actions and the speed changes from high to low speed as experienced with multi-speed motors.

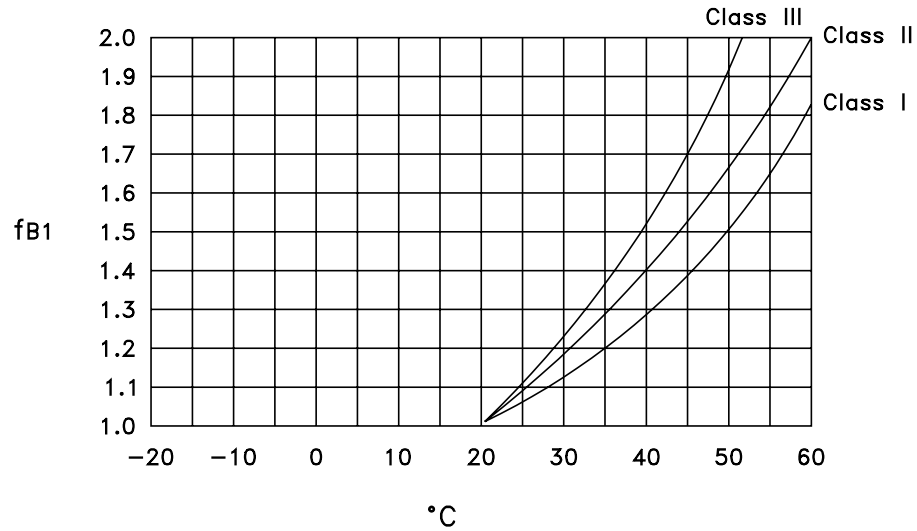
Example: Load Class I with 200 starts and stops per hour and operating time of 24 hours per day gives $f_B = 1.36$.

AGMA

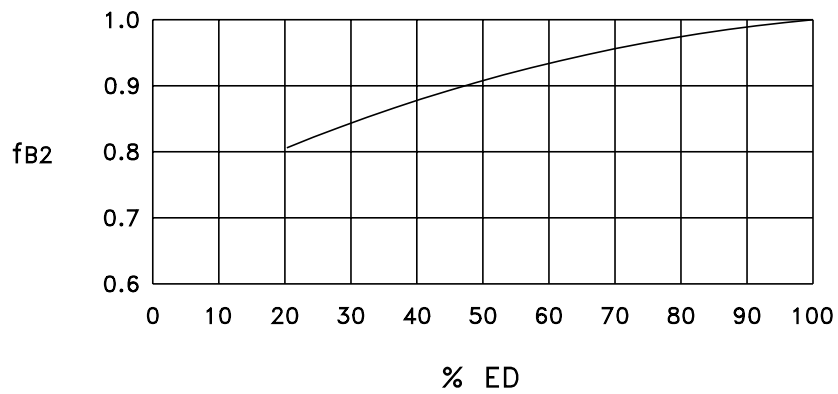
For Service Factors using AGMA criteria, please refer to the guidelines on page 4.



Service Factor for Increased Ambient Temperatures

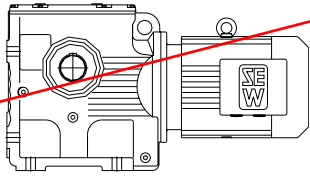
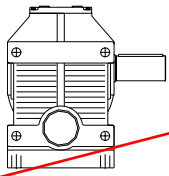


Service Factor for Intermittent Duty



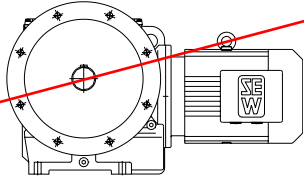
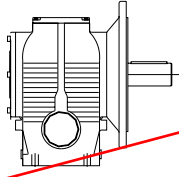
$$\%ED = \frac{\text{Running Time in Minutes}}{60 \text{ Minutes}} \times 100$$

Mounting Options



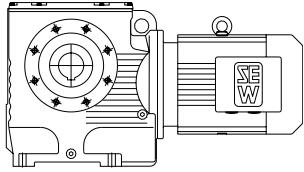
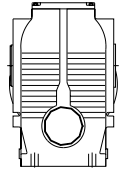
S

Solid shaft
Foot mount



SF

Solid shaft
Flange mount (D & B5 style flange with through holes)



SA

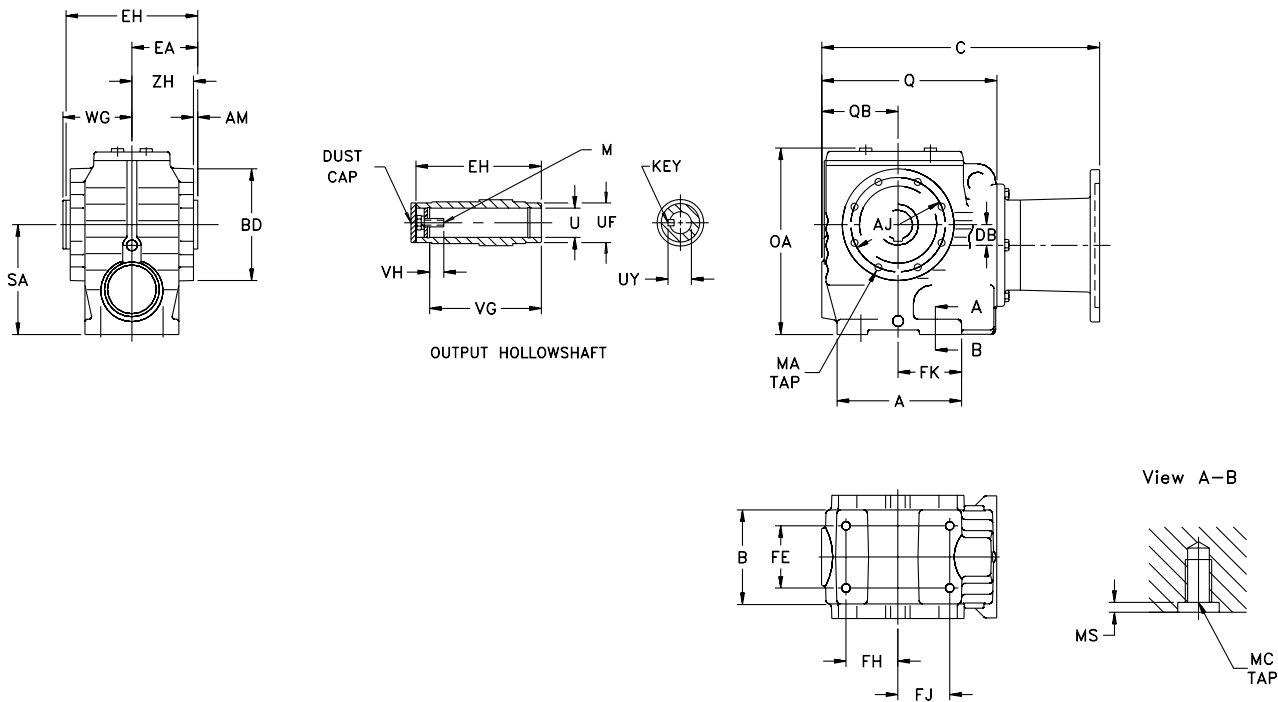
Hollowshaft with key
Shaft mount

| Ratio i | S97 | | | | | AM182 | | | AM184 | | | AM213 | | | AM215 | | |
|------------|---------------------------------------|--|---|---------------------|---|-------------------------------------|--|-------------------------------------|-------------------------------------|--|-------------------------------------|-------------------------------------|--|-------------------------------------|-------------------------------------|--|-------------------------------------|
| | Output Speed n _a rpm | Input Power P _{emax} HP | Output Torque T _{amax} lb-in | Stages Pri. Sec. | | Input Power P _e HP | Output Torque T _a lb-in | Output OHL F _{Ra} lb | Input Power P _e HP | Output Torque T _a lb-in | Output OHL F _{Ra} lb | Input Power P _e HP | Output Torque T _a lb-in | Output OHL F _{Ra} lb | Input Power P _e HP | Output Torque T _a lb-in | Output OHL F _{Ra} lb |
| 286.40 | 6.10 | 4.79 | 35400 | 2 | - | 3 | 20800 | 8060 | 4.79 | 35400 | 7470 | - | - | - | - | - | - |
| 262.22 | 6.70 | 5.19 | 35400 | 2 | - | 3 | 19000 | 8100 | 5 | 33200 | 7580 | - | - | - | - | - | - |
| 231.67 | 7.50 | 5.85 | 35000 | 2 | - | 3 | 16800 | 8170 | 5 | 29400 | 7760 | 5.85 | 35000 | 7490 | 5.85 | 35000 | 7490 |
| 196.52 | 8.90 | 6.65 | 34000 | 2 | - | 3 | 14200 | 8210 | 5 | 25000 | 7920 | 6.65 | 34000 | 7540 | 6.65 | 34000 | 7540 |
| 180.95 | 9.70 | 7.05 | 33400 | 2 | - | 3 | 13000 | 8240 | 5 | 23000 | 7990 | 7.05 | 33400 | 7580 | 7.05 | 33400 | 7580 |
| 161.74 | 11 | 7.58 | 32300 | 2 | - | 3 | 11600 | 8260 | 5 | 20500 | 8060 | 7.50 | 31900 | 7650 | 7.58 | 32300 | 7630 |
| 145.60 | 12 | 8.11 | 31400 | 2 | - | 3 | 10400 | 8280 | 5 | 18500 | 8120 | 7.50 | 28800 | 7790 | 8.11 | 31400 | 7670 |
| 131.85 | 13 | 8.65 | 30400 | 2 | - | 3 | 9290 | 8300 | 5 | 16600 | 8170 | 7.50 | 26000 | 7880 | 8.65 | 30400 | 7720 |
| 116.92 | 15 | 9.44 | 29600 | 2 | - | 3 | 8050 | 8300 | 5 | 14700 | 8210 | 7.50 | 23100 | 7990 | 9.44 | 29600 | 7740 |
| 105.71 | 17 | 9.98 | 28400 | 2 | - | 3 | 7260 | 8330 | 5 | 13300 | 8240 | 7.50 | 20800 | 8060 | 10 | 28400 | 7790 |
| 89.60 | 20 | 11.04 | 26700 | 2 | - | 3 | 5970 | 8330 | 5 | 11200 | 8260 | 7.50 | 17600 | 8150 | 10 | 24100 | 7940 |
| 80.85 | 22 | 11.31 | 28900 | 2 | - | 3 | 7040 | 8330 | 5 | 12200 | 8260 | - | - | - | - | - | - |
| 78.26 | 22 | 11.97 | 25400 | 2 | - | - | - | - | - | - | - | 7.50 | 15300 | 8190 | 10 | 21000 | 8060 |
| 71.43 | 25 | 12.90 | 29200 | 2 | - | 3 | 6150 | 8330 | 5 | 10800 | 8280 | 7.50 | 16600 | 8170 | 10 | 22400 | 8010 |
| 65.45 | 27 | 13.03 | 23500 | 2 | - | - | - | - | - | - | - | 7.50 | 12700 | 8240 | 10 | 17500 | 8150 |
| 60.59 | 29 | 15.16 | 29200 | 2 | - | 3 | 5180 | 8330 | 5 | 9120 | 8300 | 7.50 | 14100 | 8210 | 10 | 19000 | 8100 |
| 55.79 | 31 | 16.36 | 29200 | 2 | - | 3 | 4730 | 8330 | 5 | 8320 | 8300 | 7.50 | 12900 | 8240 | 10 | 17500 | 8150 |
| 49.87 | 35 | 18.35 | 29200 | 2 | - | 3 | 4160 | 8350 | 5 | 7430 | 8300 | 7.50 | 11500 | 8260 | 10 | 15700 | 8190 |
| 44.89 | 39 | 20.35 | 29200 | 2 | - | 3 | 3720 | 8350 | 5 | 6640 | 8330 | 7.50 | 10400 | 8280 | 10 | 14100 | 8210 |
| 40.65 | 43 | 21.81 | 28600 | 2 | - | 3 | 3320 | 8350 | 5 | 5970 | 8330 | 7.50 | 9380 | 8300 | 10 | 12700 | 8080 |
| 36.05 | 49 | 23.67 | 27500 | 2 | - | 3 | 2880 | 8350 | 5 | 5270 | 8330 | 7.50 | 8230 | 8100 | 10 | 11200 | 7880 |
| 32.60 | 54 | 25.27 | 26400 | 2 | - | 3 | 2570 | 8280 | 5 | 4730 | 8120 | 7.50 | 7430 | 7900 | 10 | 10200 | 7700 |
| 26.39 | 66 | 26.60 | 23000 | 2 | - | 3 | 2300 | 7700 | 5 | 4120 | 7490 | 7.50 | 6370 | 7250 | 10 | 8580 | 6980 |
| 23.59 | 74 | 29.26 | 23000 | 2 | - | 3 | 2040 | 7470 | 5 | 3630 | 7290 | 7.50 | 5660 | 7070 | 10 | 7700 | 6820 |
| 21.23 | 82 | 31.92 | 22700 | 2 | - | 3 | 1810 | 7270 | 5 | 3270 | 7090 | 7.50 | 5090 | 6890 | 10 | 6900 | 6680 |
| 19.23 | 91 | 34.58 | 22100 | 2 | - | 3 | 1630 | 7070 | 5 | 2920 | 6910 | 7.50 | 4600 | 6730 | 10 | 6240 | 6530 |
| 17.05 | 103 | 37.24 | 21200 | 2 | - | 3 | 1420 | 6840 | 5 | 2570 | 6710 | 7.50 | 4030 | 6530 | 10 | 5490 | 6370 |
| 15.42 | 114 | 39.90 | 20400 | 2 | - | 3 | 1260 | 6640 | 5 | 2300 | 6530 | 7.50 | 3630 | 6370 | 10 | 4960 | 6210 |
| 13.07 | 134 | 43.89 | 19200 | 2 | - | 3 | 1040 | 6350 | 5 | 1950 | 6230 | 7.50 | 3050 | 6100 | 10 | 4160 | 5990 |
| 11.41 | 153 | 46.55 | 17700 | 2 | - | - | - | - | - | - | - | 7.50 | 2660 | 5900 | 10 | 3630 | 5780 |
| 9.55 | 183 | 46.55 | 14800 | 2 | - | - | - | - | - | - | - | 7.50 | 2170 | 5630 | 10 | 3010 | 5540 |
| 8.26 | 212 | 46.55 | 12700 | 2 | - | - | - | - | - | - | - | 7.50 | 1860 | 5420 | 10 | 2570 | 5330 |

Please consult your SEW-Eurodrive Assembly Center for additional speed (RPM) selections and dimension pages not listed.

Dimensions

Type SA Speed Reducers with NEMA C-Face - Shaft Mounted



Gearcase

| Model | A | AJ | AM | B | BD | DB | EA | FE | FH | FJ | FK | MA | MC | MS | OA |
|-----------------|------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------------|-----------------------|-----------------|------------------|
| SA87 | 10.24 | 7.09 | 0.20 | 7.64 | 8.46 | 1.48 | 4.92 | 4.65 | 4.53 | 4.33 | 4.92 | M16 x 1.02 | M16 x 1.26 | 0.24 | 14.49 |
| | 260 | 180 | 5 | 194 | 215 | 37.5 | 125 | 118 | 115 | 110 | 125 | M16 x 26 | M16 x 32 | 6 | 368 |
| SA97 | 11.85 | 8.66 | 0.20 | 9.29 | 10.24 | 2.05 | 5.71 | 6.30 | 5.31 | 4.45 | 5.51 | M16 x 1.02 | M20 x 1.42 | 0.24 | 17.91 |
| | 301 | 220 | 5 | 236 | 260 | 52 | 145 | 160 | 135 | 113 | 140 | M16 x 26 | M20 x 36 | 6 | 455 |

Gearcase

| Model | Q | QB | SA | WG | ZH |
|-----------------|------------------|-----------------|-----------------|-----------------|-----------------|
| SA87 | 13.39 | 5.91 | 8.86 | 5.04 | 4.72 |
| | 340 | 150 | 225 | 128 | 120 |
| SA97 | 16.54 | 7.09 | 11.02 | 5.87 | 5.51 |
| | 420 | 180 | 280 | 149 | 140 |

Output Shaft Inch Series/Optional Metric Series For solid shaft design, see page 544.

| EH | UF | U | UY | VG | VH | Key | M |
|-----------------|-----------------|------------------|-----------------|-----------------|-----------------|------------------------|---------------------|
| 9.84 | 3.74 | 2.375 | 2.65 | 8.66 | 1.37 | 5/8 5/8 3/4 | 3/4 10 2 |
| 250 | 95 | 70 | 74.9 | 220 | 34 | 20 x 12 x 110 | M20 x 50 |
| 11.42 | 4.72 | 2.750 | 3.03 | 10.23 | 1.24 | 5/8 5/8 3/4 | 3/4 10 2 |
| 290 | 120 | 90 | 95.4 | 255 | 41 | 25 x 14 x 140 | M24 x 60 |

Motor Compatibility - NEMA

| Model | C | NEMA LP | | | | |
|-----------------|--------------|------------------|------------------|------------------|------------------|----------------|
| | | 143TC 145TC | 182TC 184TC | 213TC 215TC | 254TC 256TC | 284TC 286TC |
| SA87 | C | 18.07 | 20.67 | 20.67 | 23.78 | — |
| | | 459 | 525 | 525 | 604 | — |
| SA97 | C | — | 23.62 | 23.62 | 26.73 | 28.78 |
| | | — | 600 | 600 | 679 | 731 |

Dimensions are **inch**
mm

Dimension C is to motor mounting surface

For the selected LP adapter size the pinion bore must be available in the desired gear ratio for the reducer. Please see the compatibility tables beginning on page 496.

Refer to page 556 for standard NEMA C-Face dimensions.

See page 543 for available output shaft sizes.

Motor Compatibility - IEC

| Model | C | IEC LP | | | | | | | |
|-----------------|--------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|--------------|
| | | 80 | 90 | 100 | 112 | 132ML | 132S/M | 160 | 180 |
| SA87 | C | 17.20 | 17.80 | 19.65 | 19.65 | 23.19 | 20.67 | 24.37 | — |
| | | 437 | 452 | 499 | 499 | 589 | 525 | 619 | — |
| SA97 | C | — | — | 22.60 | 22.60 | 26.14 | 23.62 | 27.32 | 28.74 |
| | | — | — | 574 | 574 | 664 | 600 | 694 | 730 |



Section 6 Parts Lists & Vendor Data

6.3 Anchor Bolt Data



Attached are page(s) from the 2014 Hilti North American Product Tech Guide. For complete details on this product, including data development, product specifications, general suitability, installation, corrosion, and spacing and edge distance guidelines, please refer to the Technical Guide, or contact Hilti.

3.2.3 HIT-HY 200 Adhesive Anchoring System

- 3.2.3.1 Product description
- 3.2.3.2 Material specifications
- 3.2.3.3 Technical data
- 3.2.3.4 Installation instructions
- 3.2.3.5 Ordering information



HIT-HY 200-A



HIT-HY 200-R

Listings/Approvals

ICC-ES (International code council)
ESR-3187



Independent code evaluation

IBC®/IRC® 2009
IBC®/IRC® 2006
IBC®/IRC® 2003

LEED® Credit 4.1-Low Emitting Materials

The Leadership in Energy and Environmental Design (LEED®) Green Building Rating system™ is the nationally accepted benchmark for the design, construction and operation of high performance green buildings.



3.2.3.1 Product description

Hilti HIT-HY 200 adhesive is an injectable, two-component, hybrid adhesive. The two components are separated by means of a dual-cylinder foil pack attached to a manifold. The two components combine and react when dispensed through a static mixing nozzle attached to the manifold.

Hilti HIT-HY 200 adhesive is available in two options, Hilti HIT-HY 200-A, and Hilti HIT-HY 200-R. Both options utilize the same technical data. Hilti HIT-HY 200-A will have shorter working times and curing times than Hilti HIT-HY 200-R. The packaging for each is different which helps the user distinguish between the two adhesives.

Hilti HIT-HY 200 adhesive comes with three hole cleaning options:

- The traditional hole cleaning method uses steel wire brushes and compressed air
- The self-cleaning method uses the Hilti TE-CD or TE-YD Hollow Drill Bits in conjunction with a Hilti vacuum to remove the dust as you drill. The hole is clean and ready for anchor installation.
- The no-cleaning method requires the use of Hilti HIT-Z and HIT-Z-R threaded anchor rods. If the base material temperature is less than 41° F (5° C) or if diamond core drilling is used, then the drilled hole must be cleaned.

Elements that are suitable for use with this system are threaded steel rods, Hilti HIS-(R)N steel internally threaded inserts, steel reinforcing bars and Hilti HIT-Z and HIT-Z-R threaded rods.

Product features

- Two great products with equal performance data
- User can select product gel time suitability based on temperature of the base material and jobsite time requirements
- No hole cleaning requirement when installed SafeSet™ hollow drill bit technology
- No hole cleaning requirement when installing HIT-Z rods in dry conditions
- ICC-ES approved for cracked concrete and seismic service
- May be installed in diamond cored holes when additional cleaning steps are employed

Guide specifications

Injectable adhesive shall be used for installation of threaded rods (rebar) (inserts) into existing concrete. Adhesive shall be furnished in containers which keep component A and component B separate. Containers shall be designed to accept static mixing nozzle which thoroughly blends component A and component B and allows injection of the mixed adhesive directly into the drilled hole. Only injection tools and static mixing nozzles supplied by the manufacturer may be used. Injection adhesive shall be formulated to include the resin and hardener to provide optimal curing speed, high strength and stiffness. Injection adhesive anchor system shall be Hilti HIT-HY 200 installed using Hilti Safe Set™ Technology. HIT-HY 200 System shall be supplied by Hilti.

HIT-HY 200 Adhesive Anchoring System 3.2.3

3.2.3.3 Hilti HIT-HY 200-AR Adhesive with Hilti HAS threaded rod



Figure 9 -HAS threaded rod installation conditions

| | | | | |
|---------------------------------|--------------------|--------------------------|-----------------------------|---|
| Permissible concrete conditions | Uncracked concrete | Dry concrete | Permissible drilling method | Hammer drilling with carbide tipped drill bit |
| | Cracked concrete | Water saturated concrete | | Hilti TE-CD or TE-YD Hollow Drill Bit |

Table 38 - HAS threaded rod specifications

| Setting information | Symbol | Units | Nominal rod diameter | | | | | | | |
|------------------------------|---------------|---------------|----------------------|----------------|--------------------|--------------------|--------------------|--------------------|--------------------|-------|
| | | | 3/8 | 1/2 | 5/8 | 3/4 | 7/8 | 1 | 1-1/8 | 1-1/4 |
| Nominal bit diameter | d_o | in. | 7/16 | 9/16 | 3/4 | 7/8 | 1 | 1-1/8 | 1-3/8 | |
| Standard effective embedment | $h_{ef, std}$ | in. (mm) | 3-3/8 (86) | 4-1/2 (114) | 5-5/8 (143) | 6-3/4 (171) | 7-7/8 (200) | 9 (229) | 11-1/4 (286) | |
| Effective embedment | minimum | $h_{ef, min}$ | 2-3/8 (60) | 2-3/4 (70) | 3-1/8 (79) | 3-1/2 (89) | 3-1/2 (89) | 4 (102) | 5 (127) | |
| | maximum | $h_{ef, max}$ | 7-1/2 (191) | 10 (254) | 12-1/2 (318) | 15 (381) | 17-1/2 (445) | 20 (508) | 25 (635) | |
| Fixture hole diameter | through-set | in. | 1/2 | 5/8 | 13/16 ¹ | 15/16 ¹ | 1-1/8 ¹ | 1-1/4 ¹ | 1-1/2 ¹ | |
| Fixture hole diameter | preset | in. | 7/16 | 9/16 | 11/16 | 13/16 | 15/16 | 1-1/8 | 1-3/8 | |
| Installation torque | T_{inst} | ft-lb (Nm) | 15 (20) | 30 (40) | 60 (80) | 100 (136) | 125 (169) | 150 (203) | 200 (271) | |

¹ Install using (2) washers. See Figure 11.

Figure 10 - HAS threaded rods

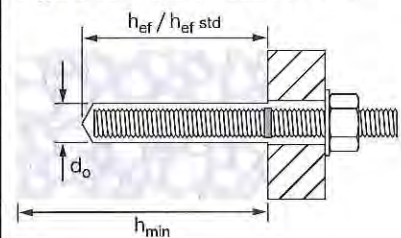


Figure 11 - Installation with (2) washers



HAS-E carbon steel threaded rod specifications

Carbon steel rods conform to ISO 898 class 5.8 with a minimum tensile strength of 72.5 ksi (500 MPa) and a minimum yield strength of 58 ksi (400 MPa).

HAS-E nuts conform to SAE J995 Grade 5.

HAS-E washers conform to ASTM F884, HV, and ANSI B18.22.1 Type A Plain.

HAS-E rod, nut and washer has an electroplated zinc coating conforming to ASTM B633, SC 1.

HAS Super high strength threaded rod specifications

Carbon steel rods manufactured from ASTM A193, Grade B7, with a minimum tensile strength of 125 ksi (862 MPa) and a minimum yield strength of 105 ksi (724 MPa).

HAS Super nuts conform to SAE J995 Grade 5.

HAS Super washers conform to ASTM F884, HV, and ANSI B18.22.1 Type A Plain.

HAS Super rods, nuts and washers, except the 7/8-in. diameter, have an electroplated zinc coating conforming to ASTM B633, SC1.

7/8-in. HAS Super rods, nuts and washers are hot-dip galvanized in accordance with ASTM A153.

HAS-R 304 stainless steel

3/8-, 1/2- and 5/8-in. rods manufactured from AISI Type 304 stainless steel with a minimum tensile strength of 100 ksi (689 MPa) and a minimum yield strength of 65 ksi (448 MPa).

3/4-, 1- and 1 1/4-in. rods are manufactured from AISI Type 304 stainless steel conforming to ASTM F593 Condition CW or cold worked.

AISI Type 304 stainless steel nuts conform to ASTM F594.

AISI Type 304 stainless steel washers conform to ASTM A240 and ANSI B18.22.1 Type A Plain.

HAS-R 316 stainless steel

3/8-, 1/2- and 5/8-in. rods manufactured from AISI Type 316 stainless steel with a minimum tensile strength of 100 ksi (689 MPa) and a minimum yield strength of 65 ksi (448 MPa).

3/4-, 1- and 1 1/4-in. rods are manufactured from AISI Type 316 stainless steel conforming to ASTM F593 Condition CW.

AISI Type 316 stainless steel nuts conform to ASTM F594.

AISI Type 316 stainless steel washers conform to ASTM A240 and ANSI B18.22.1 Type A Plain.

3.2.3 HIT-HY 200 Adhesive Anchoring System

Table 39 - Hilti HIT-HY 200 adhesive design strength with concrete / bond failure for threaded rod in uncracked concrete ^{1,2,3,4,5,6,7,8}

| Nominal anchor diameter in. | Effective embedment in. (mm) | Tension — ΦN_n or N_t | | | | Shear — ΦV_n or V_t | | | |
|-----------------------------|------------------------------|--|--|--|--|--|--|--|--|
| | | $f'_c = 2500$ psi (17.2 Mpa) lb (kN) | $f'_c = 3000$ psi (20.7 Mpa) lb (kN) | $f'_c = 4000$ psi (27.6 Mpa) lb (kN) | $f'_c = 6000$ psi (41.4 Mpa) lb (kN) | $f'_c = 2500$ psi (17.2 Mpa) lb (kN) | $f'_c = 3000$ psi (20.7 Mpa) lb (kN) | $f'_c = 4000$ psi (27.6 Mpa) lb (kN) | $f'_c = 6000$ psi (41.4 Mpa) lb (kN) |
| 3/8 | 2-3/8 (60) | 2,855 (12.7) | 3,125 (13.9) | 3,415 (15.2) | 3,620 (16.1) | 3,075 (13.7) | 3,370 (15.0) | 3,680 (16.4) | 3,900 (17.3) |
| | 3-3/8 (86) | 4,835 (21.5) | 4,855 (21.6) | 4,855 (21.6) | 5,150 (22.9) | 10,415 (46.3) | 10,460 (46.5) | 10,460 (46.5) | 11,085 (49.3) |
| | 4-1/2 (114) | 6,475 (28.8) | 6,475 (28.8) | 6,475 (28.8) | 6,665 (30.5) | 13,945 (62.0) | 13,945 (62.0) | 13,945 (62.0) | 14,785 (65.8) |
| | 7-1/2 (191) | 10,790 (48.0) | 10,790 (48.0) | 10,790 (48.0) | 11,440 (50.9) | 23,245 (103.4) | 23,245 (103.4) | 23,245 (103.4) | 24,640 (109.6) |
| 1/2 | 2-3/4 (70) | 3,555 (15.8) | 3,895 (17.3) | 4,500 (20.0) | 5,510 (24.5) | 7,660 (34.1) | 8,395 (37.3) | 9,690 (43.1) | 11,870 (52.8) |
| | 4-1/2 (114) | 7,445 (33.1) | 8,155 (36.3) | 8,635 (38.4) | 9,150 (40.7) | 16,035 (71.3) | 17,570 (78.2) | 18,595 (82.7) | 19,710 (87.7) |
| | 6 (152) | 11,465 (51.0) | 11,510 (51.2) | 11,510 (51.2) | 12,200 (54.3) | 24,690 (109.8) | 24,795 (110.3) | 24,795 (110.3) | 26,280 (116.9) |
| | 10 (254) | 19,185 (85.3) | 19,185 (85.3) | 19,185 (85.3) | 20,335 (90.5) | 41,320 (183.8) | 41,320 (183.8) | 41,320 (183.8) | 43,800 (194.8) |
| 5/8 | 3-1/8 (79) | 4,310 (19.2) | 4,720 (21.0) | 5,450 (24.2) | 6,675 (29.7) | 9,280 (41.3) | 10,165 (45.2) | 11,740 (52.2) | 14,380 (64.0) |
| | 5-5/8 (143) | 10,405 (46.3) | 11,400 (50.7) | 13,165 (58.6) | 14,300 (63.6) | 22,415 (99.7) | 24,550 (109.2) | 28,350 (126.1) | 30,795 (137.0) |
| | 7-1/2 (191) | 16,020 (71.3) | 17,550 (78.1) | 17,985 (80.0) | 19,065 (84.8) | 34,505 (153.5) | 37,800 (168.1) | 38,740 (172.3) | 41,065 (182.7) |
| | 12-1/2 (318) | 29,975 (133.3) | 29,975 (133.3) | 29,975 (133.3) | 31,775 (141.3) | 64,565 (287.2) | 64,565 (287.2) | 64,565 (287.2) | 68,440 (304.4) |
| 3/4 | 3-1/2 (89) | 5,105 (22.7) | 5,595 (24.9) | 6,460 (28.7) | 7,910 (35.2) | 11,000 (48.9) | 12,050 (53.6) | 13,915 (61.9) | 17,040 (75.8) |
| | 6-3/4 (171) | 13,680 (60.9) | 14,985 (66.7) | 17,305 (77.0) | 20,590 (91.6) | 29,460 (131.0) | 32,275 (143.6) | 37,265 (165.8) | 44,350 (197.3) |
| | 9 (229) | 21,060 (93.7) | 23,070 (102.6) | 25,900 (115.2) | 27,455 (122.1) | 45,360 (201.8) | 49,690 (221.0) | 55,785 (248.1) | 59,130 (263.0) |
| | 15 (381) | 43,165 (192.0) | 43,165 (192.0) | 43,165 (192.0) | 45,755 (203.5) | 92,975 (413.6) | 92,975 (413.6) | 92,975 (413.6) | 98,550 (438.4) |
| 7/8 | 3-1/2 (89) | 5,105 (22.7) | 5,595 (24.9) | 6,460 (28.7) | 7,910 (35.2) | 11,000 (48.9) | 12,050 (53.6) | 13,915 (61.9) | 17,040 (75.8) |
| | 7-7/8 (200) | 17,235 (76.7) | 18,885 (84.0) | 21,805 (97.0) | 26,705 (118.8) | 37,125 (165.1) | 40,670 (180.9) | 46,960 (208.9) | 57,515 (255.8) |
| | 10-1/2 (267) | 26,540 (118.1) | 29,070 (129.3) | 33,570 (149.3) | 37,365 (166.2) | 57,160 (254.3) | 62,615 (278.5) | 72,300 (321.6) | 80,485 (358.0) |
| | 17-1/2 (445) | 57,100 (254.0) | 58,755 (261.4) | 58,755 (261.4) | 62,280 (277.0) | 122,990 (547.1) | 126,545 (562.9) | 126,545 (562.9) | 134,140 (596.7) |
| 1 | 4 (102) | 6,240 (27.8) | 6,835 (30.4) | 7,895 (35.1) | 9,665 (43.0) | 13,440 (59.8) | 14,725 (65.5) | 17,000 (75.6) | 20,820 (92.6) |
| | 9 (229) | 21,060 (93.7) | 23,070 (102.6) | 26,640 (118.5) | 32,625 (145.1) | 45,360 (201.8) | 49,690 (221.0) | 57,375 (255.2) | 70,270 (312.6) |
| | 12 (305) | 32,425 (144.2) | 35,520 (158.0) | 41,015 (182.4) | 48,805 (217.1) | 69,835 (310.6) | 76,500 (340.3) | 88,335 (392.9) | 105,120 (467.6) |
| | 20 (508) | 69,765 (310.3) | 76,425 (340.0) | 76,740 (341.4) | 81,345 (361.8) | 150,265 (668.4) | 164,605 (732.2) | 165,285 (735.2) | 175,205 (779.3) |
| 1-1/4 | 5 (127) | 8,720 (38.8) | 9,555 (42.5) | 11,030 (49.1) | 13,510 (60.1) | 18,785 (83.6) | 20,575 (91.5) | 23,760 (105.7) | 29,100 (129.4) |
| | 11-1/4 (286) | 29,430 (130.9) | 32,240 (143.4) | 37,230 (165.6) | 45,595 (202.8) | 63,395 (282.0) | 69,445 (308.9) | 80,185 (356.7) | 98,205 (436.8) |
| | 15 (381) | 45,315 (201.6) | 49,640 (220.8) | 57,320 (255.0) | 70,200 (312.3) | 97,600 (434.1) | 106,915 (475.6) | 123,455 (549.2) | 151,200 (672.6) |
| | 25 (635) | 97,500 (433.7) | 106,805 (475.1) | 119,905 (533.4) | 127,100 (565.4) | 210,000 (934.1) | 230,045 (1023.3) | 258,260 (1148.8) | 273,755 (1217.7) |

1 See section 3.1.7 for explanation on development of load values.

2 See section 3.1.7.3 to convert design strength (factored resistance) value to ASD value.

3 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.

4 Apply spacing, edge distance, and concrete thickness factors in tables 42 - 55 as necessary. Compare to the steel values in table 41.

The lesser of the values is to be used for the design.

5 Data is for temperature range A: Max. short term temperature = 104° F (40° C), max. long term temperature = 75° F (24° C).

For temperature range B: Max. short term temperature = 176° F (80° C), max. long term temperature = 122° F (50° C) multiply above value by 0.80.

For temperature range C: Max. short term temperature = 248° F (120° C), max. long term temperature = 162° F (72° C) multiply above value by 0.70.

Short term elevated concrete temperatures are those that occur over brief intervals, e.g., as a result of diurnal cycling. Long term concrete temperatures are roughly constant over significant periods of time.

6 Tabular values are for dry concrete conditions. For water saturated concrete multiply design strength (factored resistance) by 0.85.

7 Tabular values are for short term loads only. For sustained loads including overhead use, see section 3.1.7.5.

8 Tabular values are for normal weight concrete only. For lightweight concrete, multiply design strength (factored resistance) by λ_s as follows:

For sand-lightweight, $\lambda_s = 0.51$. For all-lightweight, $\lambda_s = 0.45$.

HIT-HY 200 Adhesive Anchoring System 3.2.3

Table 40 - Hilti HIT-HY 200 adhesive design strength with concrete / bond failure for threaded rod in cracked concrete ^{1,2,3,4,5,6,7,8,9}

| Nominal anchor diameter in. | Effective embedment in. (mm) | Tension — $\Phi N_{t,n}$ or N_t | | | | Shear — $\Phi V_{t,n}$ or V_t | | | |
|-----------------------------|------------------------------|--|--|--|--|--|--|--|--|
| | | $f'_c = 2500$ psi (17.2 Mpa) lb (kN) | $f'_c = 3000$ psi (20.7 Mpa) lb (kN) | $f'_c = 4000$ psi (27.6 Mpa) lb (kN) | $f'_c = 6000$ psi (41.4 Mpa) lb (kN) | $f'_c = 2500$ psi (17.2 Mpa) lb (kN) | $f'_c = 3000$ psi (20.7 Mpa) lb (kN) | $f'_c = 4000$ psi (27.6 Mpa) lb (kN) | $f'_c = 6000$ psi (41.4 Mpa) lb (kN) |
| 3/8 | 2-3/8 (60) | 1,900 (8.5) | 1,900 (8.5) | 1,900 (8.5) | 2,015 (9.0) | 2,045 (9.1) | 2,045 (9.1) | 2,045 (9.1) | 2,165 (9.6) |
| | 3-3/8 (86) | 2,700 (12.0) | 2,700 (12.0) | 2,700 (12.0) | 2,860 (12.7) | 5,810 (25.8) | 5,810 (25.8) | 5,810 (25.8) | 6,160 (27.4) |
| | 4-1/2 (114) | 3,600 (16.0) | 3,600 (16.0) | 3,600 (16.0) | 3,815 (17.0) | 7,750 (34.5) | 7,750 (34.5) | 7,750 (34.5) | 8,215 (36.5) |
| | 7-1/2 (191) | 5,995 (26.7) | 5,995 (26.7) | 5,995 (26.7) | 6,355 (28.3) | 12,915 (57.4) | 12,915 (57.4) | 12,915 (57.4) | 13,690 (60.9) |
| 1/2 | 2-3/4 (70) | 2,520 (11.2) | 2,760 (12.3) | 2,950 (13.1) | 3,130 (13.9) | 5,425 (24.1) | 5,945 (26.4) | 6,355 (28.3) | 6,735 (30.0) |
| | 4-1/2 (114) | 4,830 (21.5) | 4,830 (21.5) | 4,830 (21.5) | 5,120 (22.8) | 10,400 (46.3) | 10,400 (46.3) | 10,400 (46.3) | 11,025 (49.0) |
| | 6 (152) | 6,440 (28.6) | 6,440 (28.6) | 6,440 (28.6) | 6,825 (30.4) | 13,870 (61.7) | 13,870 (61.7) | 13,870 (61.7) | 14,700 (65.4) |
| | 10 (254) | 10,730 (47.7) | 10,730 (47.7) | 10,730 (47.7) | 11,375 (50.6) | 23,115 (102.8) | 23,115 (102.8) | 23,115 (102.8) | 24,500 (109.0) |
| 5/8 | 3-1/8 (79) | 3,050 (13.6) | 3,345 (14.9) | 3,860 (17.2) | 4,470 (19.9) | 6,575 (29.2) | 7,200 (32.0) | 8,315 (37.0) | 9,625 (42.8) |
| | 5-5/8 (143) | 7,370 (32.8) | 7,590 (33.8) | 7,590 (33.8) | 8,045 (35.8) | 15,875 (70.6) | 16,345 (72.7) | 16,345 (72.7) | 17,325 (77.1) |
| | 7-1/2 (191) | 10,120 (45.0) | 10,120 (45.0) | 10,120 (45.0) | 10,725 (47.7) | 21,790 (96.9) | 21,790 (96.9) | 21,790 (96.9) | 23,100 (102.8) |
| | 12-1/2 (318) | 16,865 (75.0) | 16,865 (75.0) | 16,865 (75.0) | 17,875 (79.5) | 36,320 (161.6) | 36,320 (161.6) | 36,320 (161.6) | 38,500 (171.3) |
| 3/4 | 3-1/2 (89) | 3,620 (16.1) | 3,965 (17.6) | 4,575 (20.4) | 5,605 (24.9) | 7,790 (34.7) | 8,535 (38.0) | 9,855 (43.8) | 12,070 (53.7) |
| | 6-3/4 (171) | 9,690 (43.1) | 10,615 (47.2) | 10,980 (48.8) | 11,635 (51.8) | 20,870 (92.8) | 22,860 (101.7) | 23,645 (105.2) | 25,065 (111.5) |
| | 9 (229) | 14,640 (65.1) | 14,640 (65.1) | 14,640 (65.1) | 15,515 (69.0) | 31,530 (140.3) | 31,530 (140.3) | 31,530 (140.3) | 33,420 (148.7) |
| | 15 (381) | 24,395 (108.5) | 24,395 (108.5) | 24,395 (108.5) | 25,860 (115.0) | 52,550 (233.8) | 52,550 (233.8) | 52,550 (233.8) | 55,700 (247.8) |
| 7/8 | 3-1/2 (89) | 3,620 (16.1) | 3,965 (17.6) | 4,575 (20.4) | 5,605 (24.9) | 7,790 (34.7) | 8,535 (38.0) | 9,855 (43.8) | 12,070 (53.7) |
| | 7-7/8 (200) | 12,210 (54.3) | 12,665 (56.3) | 12,665 (56.3) | 13,425 (59.7) | 26,300 (117.0) | 27,275 (121.3) | 27,275 (121.3) | 28,910 (128.6) |
| | 10-1/2 (267) | 16,885 (75.1) | 16,885 (75.1) | 16,885 (75.1) | 17,900 (79.6) | 36,370 (161.8) | 36,370 (161.8) | 36,370 (161.8) | 38,550 (171.5) |
| | 17-1/2 (445) | 28,140 (125.2) | 28,140 (125.2) | 28,140 (125.2) | 29,830 (132.7) | 60,615 (269.6) | 60,615 (269.6) | 60,615 (269.6) | 64,250 (285.8) |
| 1 | 4 (102) | 4,420 (19.7) | 4,840 (21.5) | 5,590 (24.9) | 6,845 (30.4) | 9,520 (42.3) | 10,430 (46.4) | 12,040 (53.6) | 14,750 (65.6) |
| | 9 (229) | 14,920 (66.4) | 16,340 (72.7) | 16,615 (73.9) | 17,610 (78.3) | 32,130 (142.9) | 35,195 (156.6) | 35,785 (159.2) | 37,930 (168.7) |
| | 12 (305) | 22,150 (98.5) | 22,150 (98.5) | 22,150 (98.5) | 23,480 (104.4) | 47,710 (212.2) | 47,710 (212.2) | 47,710 (212.2) | 50,575 (225.0) |
| | 20 (508) | 36,920 (164.2) | 36,920 (164.2) | 36,920 (164.2) | 39,135 (174.1) | 79,520 (353.7) | 79,520 (353.7) | 79,520 (353.7) | 84,290 (374.9) |
| 1-1/4 | 5 (127) | 6,175 (27.5) | 6,765 (30.1) | 7,815 (34.8) | 9,570 (42.6) | 13,305 (59.2) | 14,575 (64.8) | 16,830 (74.9) | 20,610 (91.7) |
| | 11-1/4 (286) | 20,850 (92.7) | 22,840 (101.6) | 26,130 (116.2) | 27,700 (123.2) | 44,905 (199.7) | 49,190 (218.8) | 56,285 (250.4) | 59,660 (265.4) |
| | 15 (381) | 32,095 (142.8) | 34,840 (155.0) | 34,840 (155.0) | 36,935 (164.3) | 69,135 (307.5) | 75,045 (333.8) | 75,045 (333.8) | 79,545 (353.8) |
| | 25 (635) | 58,070 (258.3) | 58,070 (258.3) | 58,070 (258.3) | 61,555 (273.8) | 125,075 (556.4) | 125,075 (556.4) | 125,075 (556.4) | 132,580 (589.7) |

3.2.3

- See section 3.1.7 for explanation on development of load values.
- See section 3.1.7.3 to convert design strength (factored resistance) value to ASD value.
- Linear interpolation between embedment depths and concrete compressive strengths is not permitted.
- Apply spacing, edge distance, and concrete thickness factors in Tables 42 - 55 as necessary. Compare to the steel values in Table 41. The lesser of the values is to be used for the design.
- Data is for temperature range A: Max. short term temperature = 104° F (40° C), max. long term temperature = 75° F (24° C).
For temperature range B: Max. short term temperature = 176° F (80° C), max. long term temperature = 122° F (50° C) multiply above value by 0.80.
For temperature range C: Max. short term temperature = 248° F (120° C), max. long term temperature = 162° F (72° C) multiply above value by 0.70.
Short term elevated concrete temperatures are those that occur over brief intervals, e.g., as a result of diurnal cycling. Long term concrete temperatures are roughly constant over significant periods of time.
- Tabular values are for dry concrete conditions. For water saturated concrete multiply design strength (factored resistance) by 0.85.
- Tabular values are for short term loads only. For sustained loads including overhead use, see section 3.1.7.5.
- Tabular values are for normal weight concrete only. For lightweight concrete, multiply design strength (factored resistance) by λ_s as follows:
For sand-lightweight, $\lambda_s = 0.51$. For all-lightweight, $\lambda_s = 0.45$.
- Tabular values are for static loads only. For seismic loads, multiply cracked concrete tabular values by the following reduction factors:
3/8-in to 3/4-in diameter - $\alpha_{seis} = 0.60$
7/8-in to 1-1/4-in diameter - $\alpha_{seis} = 0.75$
See section 3.1.7.4 for additional information on seismic applications.

3.2.3 HIT-HY 200 Adhesive Anchoring System

Table 41 - Steel design strength for Hilti HAS threaded rods ³

| Nominal anchor diameter in. | HAS-E ⁵ | | | HAS Super ASTM A193 B7 ⁵ | | | HAS SS AISI 304/316 SS ⁵ | | |
|-----------------------------|--|--|--------------------------------|--|--|--------------------------------|--|--|--------------------------------|
| | Tensile ¹ ϕN_{sa} lb (kN) | Shear ² ϕV_{sa} lb (kN) | $\alpha_{seis,V}$ ⁴ | Tensile ¹ ϕN_{sa} lb (kN) | Shear ² ϕV_{sa} lb (kN) | $\alpha_{seis,V}$ ⁴ | Tensile ¹ ϕN_{sa} lb (kN) | Shear ² ϕV_{sa} lb (kN) | $\alpha_{seis,V}$ ⁴ |
| 3/8 | 3,655 (16.3) | 1,685 (7.5) | 0.7 | 7,265 (32.3) | 3,150 (14.0) | 0.7 | 5,040 (22.4) | 2,325 (10.3) | 0.7 |
| 1/2 | 6,690 (29.8) | 3,705 (16.5) | 0.7 | 13,300 (59.2) | 6,915 (30.8) | 0.7 | 9,225 (41.0) | 5,110 (22.7) | 0.7 |
| 5/8 | 10,650 (47.4) | 5,900 (26.2) | 0.7 | 21,190 (94.3) | 11,020 (49.0) | 0.7 | 14,690 (65.3) | 8,135 (36.2) | 0.7 |
| 3/4 | 15,765 (70.1) | 8,730 (38.8) | 0.7 | 31,360 (139.5) | 16,305 (72.5) | 0.7 | 18,480 (82.2) | 10,235 (45.5) | 0.7 |
| 7/8 | 21,755 (96.8) | 12,050 (53.6) | 0.7 | 43,285 (192.5) | 22,505 (100.1) | 0.7 | 25,510 (113.5) | 14,125 (62.8) | 0.7 |
| 1 | 28,540 (127.0) | 15,805 (70.3) | 0.7 | 56,785 (252.6) | 29,525 (131.3) | 0.7 | 33,465 (148.9) | 18,535 (82.4) | 0.7 |
| 1-1/4 | 45,670 (203.1) | 25,295 (112.5) | 0.7 | 90,850 (404.1) | 47,240 (210.1) | 0.7 | 53,540 (238.2) | 29,655 (131.9) | 0.7 |

1 Tensile = $\phi A_{sa,N} f_{tda}$ as noted in ACI 318 Appendix D

2 Shear = $\phi 0.60 A_{sa,V} f_{tld}$ as noted in ACI 318 Appendix D

3 See section 3.1.7.3 to convert design strength (factored resistance) value to ASD value.

4 Reduction factor for seismic shear only. See section 3.1.7.4 for additional information on seismic applications.


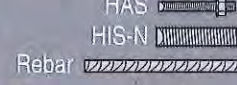





5 HAS Super rods are considered ductile steel elements. HAS standard-E and HAS SS rods are considered brittle steel elements.


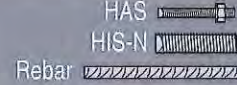





HIT-HY 200 Adhesive Anchoring System 3.2.3

3.2.3.4 Installation instructions

Installation Instructions For Use (IFU) are included with each product package. They can also be viewed or downloaded online at www.us.hilti.com (US) and www.hilti.ca (Canada). Because of the possibility of changes, always verify that downloaded IFU are current when used. Proper installation is critical to achieve full performance. Training is available on request. Contact Hilti Technical Services for applications and conditions not addressed in the IFU.

Figure 14 - HIT-HY 200 adhesive cure time and working time

| HIT-HY 200-A | | | | | |
|---|----------|---|---|---|---|
|  | |  | |  | |
| [°C] | [°F] |  t _{work} |  t _{cure} |  t _{work} |  t _{cure} |
| -10...-5 | 14...23 | 1.5 h | 7 h | - | - |
| -4...0 | 24...32 | 50 min | 4 h | - | - |
| 1...5 | 33...41 | 25 min | 2 h | - | - |
| 6...10 | 42...50 | 15 min | 1.25 h | 15 min | 1.25 h |
| 11...20 | 51...68 | 7 min | 45 min | 7 min | 45 min |
| 21...30 | 69...86 | 4 min | 30 min | 4 min | 30 min |
| 31...40 | 87...104 | 3 min | 30 min | 3 min | 30 min |

| HIT-HY 200-R | | | | | |
|---|----------|---|---|---|---|
|  | |  | |  | |
| [°C] | [°F] |  t _{work} |  t _{cure} |  t _{work} |  t _{cure} |
| -10...-5 | 14...23 | 3 h | 20 h | - | - |
| -4...0 | 24...32 | 2 h | 8 h | - | - |
| 1...5 | 33...41 | 1 h | 4 h | - | - |
| 6...10 | 42...50 | 40 min | 2.5 h | 40 min | 2.5 h |
| 11...20 | 51...68 | 15 min | 1.5 h | 15 min | 1.5 h |
| 21...30 | 69...86 | 9 min | 1 h | 9 min | 1 h |
| 31...40 | 87...104 | 6 min | 1 h | 6 min | 1 h |

Resistance of cured Hilti HIT-HY 200 to chemicals

| Chemical | | Behavior |
|----------------------------------|-----|----------|
| Acetic acid | 10% | + |
| Acetone | | • |
| Ammonia | 5% | + |
| Benzyl alcohol | | - |
| Chloric acid | 10% | • |
| Chlorinated lime | 10% | + |
| Citric acid | 10% | + |
| Concrete plasticizer | | + |
| De-icing salt (Calcium chloride) | | + |
| Deminerlized water | | + |
| Diesel fuel | | + |
| Drilling dust suspension pH 13.2 | | + |
| Ethanol | 96% | |
| Ethylacetate | | - |
| Formic acid | 10% | + |
| Formwork oil | | + |
| Gasoline | | + |
| Glycole | | • |
| Hydrogen peroxide | 10% | • |
| Lactic acid | 10% | + |
| Machinery oil | | + |
| Methylethylketon | | • |
| Nitric acid | 10% | • |
| Phosphoric acid | 10% | + |
| Potassium Hydroxide pH 13.2 | | + |
| Sea water | | + |
| Sewage sludge | | + |
| Sodium carbonate 10% | 10% | + |
| Sodium hypochlorite 2% | 2% | + |
| Sulphuric acid | 10% | + |
| | 30% | + |
| Toluene | | • |
| Xylene | | • |

Key: - non-resistant
+ resistant
• limited resistance

Samples of the HIT-HY 200 adhesive were immersed in the various chemical compounds for up to one year. At the end of the test period, the samples were analyzed. Any samples showing no visible damage and having less than a 25% reduction in bending (flexural) strength were classified as "Resistant." Samples that had slight damage, such as small cracks, chips, etc. or reduction in bending strength of 25% or more were classified as "Limited Resistance" (i.e. exposed for 48 hours or less until chemical is cleaned up). Samples that were heavily damaged or destroyed were classified as "Non-Resistant."

Note: In actual use, the majority of the adhesive is encased in the base material, leaving very little surface area exposed.

3.2.3

3.2.3 HIT-HY 200 Adhesive Anchoring System

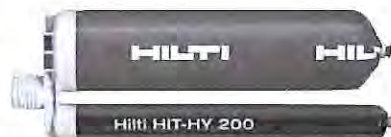
3.2.3.5 Ordering information

Hilti HIT-Z anchor rod

| Description | Bit dia. (in.) | Min. embed. (in.) | Qty |
|-------------------|----------------|-------------------|-----|
| HIT-Z 3/8 x 4 3/8 | 7/16 | 2-3/8 | 40 |
| HIT-Z 3/8 x 5 1/8 | 7/16 | 2-3/8 | 40 |
| HIT-Z 3/8 x 6 3/8 | 7/16 | 2-3/8 | 40 |
| HIT-Z 1/2 x 4 1/2 | 9/16 | 2-3/4 | 20 |
| HIT-Z 1/2 x 6 1/2 | 9/16 | 2-3/4 | 20 |
| HIT-Z 1/2 x 8 | 9/16 | 2-3/4 | 20 |
| HIT-Z 5/8 x 6 | 3/4 | 3-3/4 | 12 |
| HIT-Z 5/8 x 8 | 3/4 | 3-3/4 | 12 |
| HIT-Z 5/8 x 9 1/2 | 3/4 | 3-3/4 | 12 |
| HIT-Z 3/4 x 8 1/2 | 7/8 | 4 | 6 |
| HIT-Z 3/4 x 9 3/4 | 7/8 | 4 | 6 |



HIT-HY 200-A



HIT-HY 200-R

HIT-HY 200-A (accelerated working time)

| Description | Package contents | Qty |
|--|--|-----|
| HIT-HY 200-A (11.1 fl oz/330 ml) | Includes (1) foil pack with (1) mixer and 3/8 filler tube per pack | 1 |
| HIT-HY 200-A Master Carton (11.1 fl oz/330 ml) | Includes (1) master carton containing (25) foil packs with (1) mixer and 3/8 filler tube per pack | 25 |
| HIT-HY 200-A Combo (11.1 fl oz/330 ml) | Includes (1) master carton containing (25) foil packs with (1) mixer and 3/8 filler tube per pack and (1) HDM 500 Manual Dispenser | 25 |
| HIT-HY 200-A Master Carton (16.9 fl oz/500 ml) | Includes (1) master carton containing (20) foil packs with (1) mixer and 3/8 filler tube per pack | 20 |
| HIT-HY 200-A Combo (16.9 fl oz/500 ml) | Includes (2) master cartons containing (20) foil packs each with (1) mixer and 3/8 filler tube per pack and (1) HDM 500 Manual Dispenser | 40 |
| HIT-RE-M Static Mixer | For use with HIT-HY 200-A cartridges | 1 |

HIT-HY 200-R (regular working time)

| Description | Package contents | Qty |
|--|--|-----|
| HIT-HY 200-R (11.1 fl oz/330 ml) | Includes (1) foil pack with (1) mixer and 3/8 filler tube per pack | 1 |
| HIT-HY 200-R Master Carton (11.1 fl oz/330 ml) | Includes (1) master carton containing (25) foil packs with (1) mixer and 3/8 filler tube per pack | 25 |
| HIT-HY 200-R Combo (11.1 fl oz/330 ml) | Includes (1) master carton containing (25) foil packs with (1) mixer and 3/8 filler tube per pack and (1) HDM 500 manual dispenser | 25 |
| HIT-HY 200-R Master Carton (16.9 fl oz/500 ml) | Includes (1) master carton containing (20) foil packs with (1) mixer and 3/8 filler tube per pack | 20 |
| HIT-HY 200-R Combo (16.9 fl oz/500 ml) | Includes (2) master cartons containing (20) foil packs each with (1) mixer and 3/8 filler tube per pack and (1) HDM 500 manual dispenser | 40 |
| HIT-RE-M Static Mixer | For use with HIT-HY 200-R cartridges | 1 |

TE-CD Hollow Drill Bits

| Order Description | Working length (in.) |
|--|----------------------|
| Hollow Drill Bit TE-CD 1/2-13 | 8 |
| Hollow Drill Bit TE-CD 9/16-14 | 9-1/2 |
| Hollow Drill Bit TE-CD 5/8-14 | 9-1/2 |
| Hollow Drill Bit TE-CD 3/4-14 | 9-1/2 |
| Hollow Drill Bit TE-CD 16-A (Replacement collar) | |

TE-YD Hollow Drill Bits

| Order Description | Working Length (in.) |
|--|----------------------|
| Hollow Drill Bit TE-YD 3/4-24 | 15-1/2 |
| Hollow Drill Bit TE-YD 7/8-24 | 15-1/2 |
| Hollow Drill Bit TE-YD 1-24 | 15-1/2 |
| Hollow Drill Bit TE-YD 1 1/8-24 | 15-1/2 |
| Hollow Drill Bit TE-YD 25-A (Replacement collar) | |

HIT-HY 200 Adhesive Anchoring System 3.2.3

Threaded anchors for Hilti chemical anchor systems¹



| HAS-E Rods 5.8 steel | | | HAS Super A193, B7 high strength steel | | | HAS-R 304 stainless steel | | HAS-R 316 stainless steel | |
|----------------------|-----|-----|--|-----|-------------|---------------------------|-------------|---------------------------|--|
| Description | Qty | Qty | Description | Qty | Description | Qty | Description | Qty | |
| 3/8 x 4-3/8 | 10 | 240 | - | - | - | - | - | - | |
| 3/8x 5-1/8 | 20 | 200 | 3/8 x 5-1/8 | 20 | 3/8 x 5-1/8 | 20 | 3/8 x 5-1/8 | 20 | |
| 3/8 x 8 | 10 | 160 | - | - | 3/8 x 8 | 10 | - | - | |
| 3/8 x 12 | 10 | 90 | - | - | - | - | 3/8 x 8 | 10 | |
| 1/2 x 3-1/8 | 10 | 240 | - | - | - | - | - | - | |
| 1/2 x 4-1/2 | 10 | 160 | - | - | - | - | - | - | |
| 1/2 x 6-1/2 | 20 | 160 | 1/2 x 6-1/2 | 20 | 1/2 x 6-1/2 | 20 | 1/2 x 6-1/2 | 20 | |
| 1/2x 8 | 10 | 120 | - | - | 1/2 x 8 | 10 | 1/2 x 8 | 10 | |
| 1/2 x 10 | 10 | 120 | - | - | 1/2 x 10 | 10 | 1/2 x 11 | 10 | |
| 1/2 x 12 | 10 | 80 | - | - | - | - | 1/2 x 12 | 10 | |
| 5/8 x 8 | 20 | 80 | 5/8 x 7-5/8 | 20 | 5/8 x 7-5/8 | 20 | 5/8 x 7-5/8 | 20 | |
| 5/8 x 9 | 10 | 60 | - | - | 5/8 x 10 | 10 | 5/8 x 9 | 10 | |
| 5/8 x 12 | 10 | 60 | - | - | - | - | 5/8 x 12 | 10 | |
| 5/8 x 17 | 10 | 40 | - | - | - | - | - | - | |
| 3/4 x 10 | 10 | 40 | 3/4 x 9-5/8 | 10 | 3/4 x 9-5/8 | 10 | 3/4 x 9-5/8 | 10 | |
| 3/4 x 11 | 10 | 30 | - | - | - | - | 3/4 x 10 | 10 | |
| 3/4 x 12 | 10 | 30 | - | - | 3/4 x 12 | 10 | - | - | |
| 3/4 x 14 | 10 | 30 | 3/4 x 14 | 10 | 3/4 x 14 | 10 | 3/4 x 16 | 10 | |
| 3/4 x 17 | 10 | 20 | - | - | 3/4 x 16 | 10 | - | - | |
| 3/4 x 19 | 10 | 20 | - | - | - | - | - | - | |
| 3/4 x 21 | 10 | 20 | - | - | - | - | - | - | |
| 3/4 x 25 | 10 | 20 | - | - | - | - | - | - | |
| 7/8 x 10 | 10 | 20 | 7/8 x 10 HDG | 5 | 7/8 x 10 | 10 | 7/8 x 10 | 10 | |
| - | - | - | 7/8 x 12 HDG | 5 | - | - | - | - | |
| 7/8 x 13 | 10 | 20 | 7/8 x 16 HDG | 5 | - | - | 7/8 x 16 | 10 | |
| 1 x 12 | 4 | 16 | 1 x 12 | 4 | 1 x 12 | 4 | 1 x 12 | 4 | |
| 1 x 14 | 2 | 16 | 1 x 14 | 2 | - | - | - | - | |
| 1 x 16 | 2 | 12 | 1 x 16 | 2 | - | - | 1 x 16 | 2 | |
| 1 x 20 | 2 | 12 | 1 x 21 | 2 | - | - | 1 x 20 | 2 | |
| 1-1/4 x 16 | 4 | 8 | 1-1/4 x 16 | 4 | - | - | - | - | |
| 1-1/4 x 22 | 4 | 8 | 1-1/4 x 23 | 4 | - | - | - | - | |

3.2.3

Hilti Rods are now stamped on the end to show grade of steel and overall anchor length!

E = ISO 898 Class 5.8 Steel

B = ASTM A 193, Grade B7 Steel

R1 = AISI 304 Stainless Steel

R2 = AISI 316 Stainless Steel



HIS-N carbon steel and HIS-RN 316 stainless steel internally threaded inserts¹

| Description | Useable thread length (in) | Qty |
|-------------|----------------------------|-----|
| 3/8 x 4-1/4 | 1 | 10 |
| 1/2 x 5 | 1-3/16 | 5 |
| 5/8 x 6-5/8 | 1-1/2 | 5 |
| 3/4 x 8-1/4 | 2 | 5 |



¹ All dimensions in inches.

3.2.3 HIT-HY 200 Adhesive Anchoring System

Accessories – Dispensers

Battery Powered

Description

HDE 500-A18 Compact Battery Dispenser Kit¹

Includes dispenser, (2) compact B 18 1.6-Ah Li-Ion batteries, C 4/36 battery charger, black and red cartridge holders in a soft bag.



HDE 500-A18 Industrial Battery Dispenser Kit¹

Includes dispenser, (2) industrial B 18 3.3-Ah Li-Ion batteries, C 4/36 battery charger, black and red cartridge holders in a soft bag.



HDE 500-A18 Battery Dispenser Tool Body¹

Includes black and red cartridge holders



Battery Charger C 4/36 Li-Ion 115V

Use with all B 14.4, B 18 batteries or B 36 batteries

Battery Compact 18 1.6-Ah Li-Ion

Battery Industrial B 18 3.3-Ah Li-Ion

HDE 500-A18 Hard Case

Manual

Description

MD 1000 Manual Dispenser¹

For HIT ICE



HDM 500 Manual Dispenser with black foil pack holder

For use with 11.1 fl oz/330 ml and 16.9 fl oz/500 ml foil packs of HIT-HY 150 MAX, HIT-HY 150 MAX-SD, HIT-RE 500, RE 500-SD, HIT-HY 10 PLUS, HIT-HY 70



HDM 500 Manual Dispenser with red foil pack holder

For use with 11.1 fl oz/330 ml and 16.9 fl oz/500 ml foil pack adhesives HY 200-A and HY 200-R



HDM 500 Manual Dispenser with black and red foil pack holder

For use with 11.1 fl oz/330 ml and 16.9 fl oz/500 ml foil pack adhesives HIT-HY 200-A, HIT-HY 200-R, HIT-HY 150 MAX, HIT-HY 150 MAX-SD, HIT-RE 500, HIT-RE 500-SD, HIT-HY 10 PLUS and HIT-HY 70



HIT-CB 500 black cartridge (foil pack) holder replacement

For use with 11.1 fl oz/330 ml and 16.9 fl oz/500 ml foil packs or HIT-HY 150 MAX, HIT-HY 150 MAX-SD, HIT-RE 500, HIT-RE 500-SD, HIT-HY 10 PLUS and HIT-HY 70



HIT-CR 500 red cartridge (foil pack) holder replacement

For use with 11.1 fl oz/330 ml and 16.9 fl oz/500 ml foil pack adhesives HIT-HY 200-A and HIT-HY 200-R



HDM 500 Hard Case Only, no tool

Pneumatic with 1/4 female compressed air coupling

Description

P 3500 Pneumatic Dispenser¹

For use with HIT 11.1 fl oz/330 ml and 16.9 fl oz/500 ml foil pack



HIT-P 8000D Pneumatic Dispenser¹

For use with HIT 47.3 fl oz/1400 ml jumbo foil pack



P 3500 Cartridge (black foil pack) holder replacement

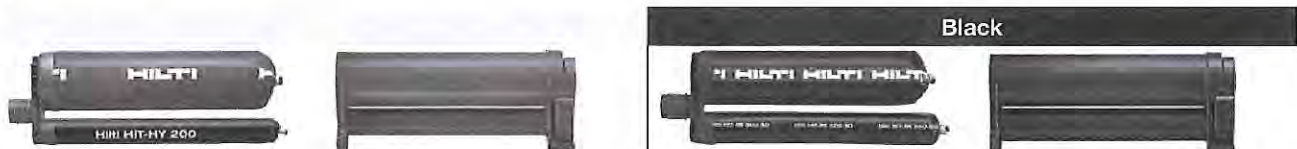
For use with the P 3500 Pneumatic Dispenser and HIT-HY 150 MAX-SD, HIT-HY 150 MAX, HIT-RE 500-SD, HIT-RE 500, HIT-HY 70 and HIT-HY 10 PLUS



¹ Dispensers not compatible with HIT-HY 200 Adhesive Anchor System.

Color coded cartridge holders with the same quality dispenser

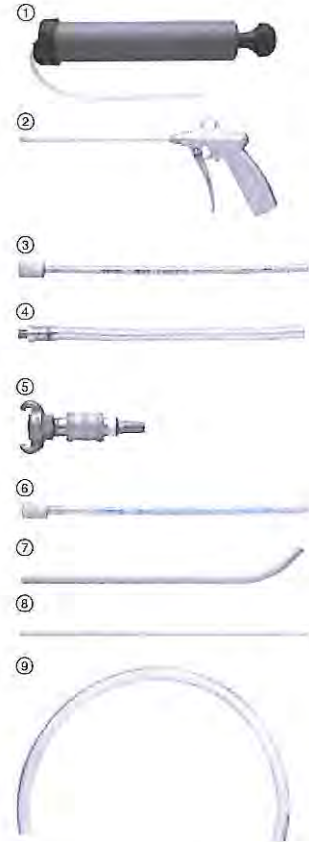
With the introduction of HIT-HY 200 and Safe Set™ Technology, Hilti has introduced a new chemistry with a 5:1 ratio. **All other Hilti adhesive anchor system have a 3:1 mix ratio.** The new technology allows for better performance and both the HDM 500 Manual Dispensers and HDE 500-A18 Battery Dispenser can accept both cartridge ratios. Simply change out the cartridge holder and you can use the dispenser on any jobsite with any Hilti foil pack adhesive.



HIT-HY 200 Adhesive Anchoring System 3.2.3

Hilti HIT Profi Accessories for blowing out drilled holes

| Description | | Diameter in. | Length ft | Qty |
|---|---|--------------|-----------|-----|
| Blow-Out Pump | ① | | | 1 |
| For use in holes up to 10 in. deep | | | | |
| Blow-Out Tool G 1/4 NPT Inlet | ② | | | 1 |
| For use in holes up to 11 in. deep. | | | | |
| For holes deeper than 11 in., use Blow-Out Tool plus the following extensions | | | | |
| Extension hose for blow-out tool HIT-DL 10/0.8 | ③ | 0.39 | 2.6 | 1 |
| Extension hose for blow-out tool HIT-DL 16/0.8 | ④ | 0.71 | 2.6 | 1 |
| 3/8 Claw-type Quick Connect HIT-DL A | ⑤ | | | 1 |
| Extension hose for HIT-DL A HIT-DL V10/1 | ⑥ | 0.39 | 3.3 | 1 |
| Extension tube HIT-DL B (Rigid/bent) | ⑦ | 0.63 | | 5 |
| Extension tube HIT-VL 16/0.7 (Rigid/straight) | ⑧ | 0.63 | 2.3 | 10 |
| Coupler for blowing extensions HIT-DL K | | 0.63 | | 10 |
| Metal coupler for splicing 16 mm extension hose | | | | |
| Extension hose HIT-VL 16 (Flexible) | ⑨ | 0.63 | 33 | 1 |
| HIT-DRS | | | | 1 |
| Dust Removal System with one hole for vacuum attachment and another hole for the Blow-Out Tool. For use with compressed air | | | | |



3.2.3

Air nozzles

Attach to extension end for proper hole cleaning¹

| Description | | Qty |
|-----------------------------------|--|-----|
| HIT-DL 1/2 | | 1 |
| Use with 10 mm diameter hose | | |
| HIT-DL 9/16 | | 1 |
| Use with 10 mm diameter hose | | |
| HIT-DL 11/16 | | 1 |
| Use with 10 mm diameter hose | | |
| HIT-DL 3/4 | | 1 |
| Use with 16 mm diameter hose/tube | | |
| HIT-DL 7/8 | | 1 |
| Use with 16 mm diameter hose/tube | | |
| HIT-DL 1 | | 1 |
| Use with 16 mm diameter hose/tube | | |
| HIT-DL 1-3/8 | | 1 |
| Use with 16 mm diameter hose/tube | | |



Also available in metric!

¹ HIT-DL size determined by the diameter of drilled hole; see Accessory Selection Table below for proper sizing

Round brush²



Piston plug (10 pack)³



Air nozzle



| Hole diameter ¹ | Description | Description | Use with hose dia. | Description |
|----------------------------|--------------|--------------|--------------------|--------------|
| 7/16 | HIT-RB 7/16 | - | - | - |
| 1/2 | HIT-RB 1/2 | HIT-IP 1/2 | 9 mm | HIT-DL 1/2 |
| 9/16 | HIT-RB 9/16 | HIT-IP 9/16 | 9 mm | HIT-DL 9/16 |
| 5/8 | HIT-RB 5/8 | HIT-IP 5/8 | 9 mm | - |
| 11/16 | HIT-RB 11/16 | HIT-IP 11/16 | 9 mm | HIT-DL 11/16 |
| 3/4 | HIT-RB 3/4 | HIT-IP 3/4 | 16 mm | HIT-DL 3/4 |
| 7/8 | HIT-RB 7/8 | HIT-IP 7/8 | 16 mm | HIT-DL 7/8 |
| 1 | HIT-RB 1 | HIT-IP 1 | 16 mm | HIT-DL 1 |
| 1-1/8 | HIT-RB 1 1/8 | HIT-IP 1 1/8 | 16 mm | - |
| 1-1/4 | HIT-RB 1 1/4 | HIT-IP 1 1/4 | 16 mm | - |
| 1- 3/8 | HIT-RB 1 3/8 | HIT-IP 1 3/8 | 16 mm | HIT-DL 1 3/8 |
| 1-1/2 | HIT-RB 1 1/2 | HIT-IP 1 1/2 | 16 mm | - |
| 1-3/4 | HIT-RB 1 3/4 | HIT-IP 1 3/4 | 16 mm | - |

¹ Refer to adhesive anchor system installation instructions to determine the proper hole diameter for the fastening element to be used.

² Attach brush to HIT-RBH T-handle, HIT-RBS or HIT-RBV extensions.

³ Use piston plugs to help prevent air voids during injection.

3.2.3 HIT-HY 200 Adhesive Anchoring System

Hilti HIT Profi Accessories for brushing drilled holes

Manual brush handle for round steel brush

| Description | Qty |
|---|-----|
| HIT-RBH (T-handle) ① Use to clean holes up to 11 in. deep | 1 |



Manual brush extension for round steel brush

| Description | Qty |
|--|-----|
| HIT-RBV 11 in. extension for HIT-RBH (T-handle) ② | 1 |



HOLDERS for brush extension RBS

Connects RBS extension to your Hilti drill for use in cleaning holes

| Description | Qty |
|----------------------------------|-----|
| TE-Y SDS Max connection ③ | 1 |
| TE-C SDS + Connection ④ | 1 |



Extensions for round steel brushes

| Description | Diameter in. | Length ft. | Qty |
|--------------------------|--------------|------------|-----|
| HIT-RBS 10/0.7 ⑤ | 0.39 | 2.3 | 1 |
| HIT-RBS-10/0.35 ⑤ | 0.39 | 1.2 | 1 |



Hilti HIT Profi Accessories for adhesive injection

Extension hoses

For use in holes deeper than 10 in.

| Description | Diameter in. | Length ft. | Qty |
|-------------------------------------|--------------|------------|-----|
| HIT-VL 9/1.0 flexible hose ⑥ | 0.35 | 3.3 | 10 |
| HIT-VL 16/0.7 rigid tube ⑦ | 0.63 | 2.3 | 10 |
| HIT-VL 16 flexible hose | 0.63 | 33 | 1 |



Coupler for injection extensions

| Description | Diameter in. | Qty |
|--|--------------|-----|
| HIT-VL K ⑧ Plastic coupler for connecting 16 mm (0.63 in.) hoses and tubes | 0.63 | 5 |



Overhead injection accessories

| Description | Hole Diameter in. | Qty |
|---------------------------------------|-------------------|-----|
| HIT-OHW overhead wedge ⑨ | 7/16 to 1-1/4 | 100 |
| HIT-OHC1 overhead drip guard ⑩ | 7/16 to 5/8 | 10 |
| HIT-OHC2 overhead drip guard | 11/16 to 1-1/4 | 10 |





Section 6 Parts Lists & Vendor Data

6.4 Additional Vendor Information

**This section was
intentionally left blank.**



Section 7 Electrical Controls & Schematics

7 Electric Controls & Schematics

**AS BUILT electrical will be
inserted here in the final O & M
manual.**



Section 8 Project Data

8 Project Data



Section 8 Project Data

8.1 Warranty (See the following pages)



Warranty

VULCAN INDUSTRIES, warrants all equipment of its own manufacture to be free of defects caused by faulty material or workmanship and shall, of its option, exchange or repair without charge, F.O.B. its factory, such part or parts thereof that prove defective under normal use within twenty-four (24) months from date of actual start-up. **VULCAN INDUSTRIES** obligation under this warranty is limited to the above and does not apply to replacement or repairs which are required as the result of improper installation, misuse, maladjustment, abnormal operating conditions, or lack of routine maintenance. Nor does the warranty include the furnishing of service for maintenance or problems arising from the foregoing causes. No claims for labor or other expenses will be recognized. This warranty is in lieu of and to the exclusion of all other warranties expressed or implied, statutory or otherwise.

VULCAN INDUSTRIES shall not be liable for any claims, losses, labor, expenses or damages, direct or consequential, resulting directly or indirectly from the use of, or the inability to use, its products, or for other consequential loss or damage of any nature arising from any cause.

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PROJECT: Wichita, KS

PROJECT NO. 19177



Section 8 Project Data

8.2 Project Specifications (See the following pages)

Job Location: Wichita, KS
Job No. 19177

MULTIPLE RAKE BAR SCREEN
MODEL #VMR-48

PART 1 GENERAL

1.01 DESCRIPTION

- A. Vulcan Industries, Inc. shall furnish four (4) fully automatic multiple rake bar screens for collecting and removing debris from the incoming wastewater flow.
- B. The multiple rake bar screens shall be provided complete with all accessories, spare parts, mounting, anchor bolts and other appurtenances as specified and as may be required for a complete and operating installation.
- C. It shall be the Contractor's responsibility to insure that the multiple rake bar screens and appurtenances furnished and installed shall be compatible with and have the necessary operating clearances to the structural elements and associated equipment shown on the Contract Drawings.

1.02 REFERENCES

- A. American Gear Manufacturers Association (AGMA)
- B. National Electrical Manufacturers Association (NEMA)
- C. American Federation of Bearing Manufacturers Association (AFBMA)
- D. American Society for Testing and Materials (ASTM)
- E. American Welding Society (AWS)
- F. Steel Structures Painting Council, American National Standards Institute (SSPC)
- G. Underwriters Laboratory (UL)

1.03 QUALITY ASSURANCE

- A. The materials covered by these specifications are intended to be standard equipment of proven reliability and as manufactured by Vulcan Industries, Inc. The equipment furnished shall be designed and constructed in accordance with the best practices and methods and shall operate satisfactorily when installed as shown on the Contract Drawings and operated per the manufacturer's recommendations.
- B. The manufacturer shall have designed and manufactured rake type bar screens for a minimum of ten (10) years.

1.04 DESIGN REQUIREMENTS

| | |
|----------------------|----------------------------|
| Number of Units | Four (4) |
| Average Daily Flow | 25.0 MGD each |
| Peak Hourly Flow | 40.0 MGD each |
| Flow Channel Width | 4'-0" |
| Flow Channel Depth | 22'-0" |
| Discharge Height EL. | 1287.55' |
| Operating Floor EL. | 1282.02' |
| Top of Bar Rack EL. | 1272.02' |
| Invert EL. | 1260.02' |
| Bar Rack Spacing | ½" clear spacing |
| Setting Inclination | 85 degrees from horizontal |

1.05 STORAGE AND HANDLING OF EQUIPMENT

- A. The CONTRACTOR shall store and temporarily support equipment prior to installation in strict accordance with the Manufacturer's recommendations and instructions. Protect all exposed surfaces. Keep records of the storage parameters and the dates that storage procedures were performed. The CONTRACTOR shall be responsible for work, equipment, and materials until inspected, tested and finally accepted.
- B. Protect the equipment from being contaminated by dust, dirt, vibration and moisture.
- C. Temporarily connect equipment with built in space heaters to a power source and keep heaters in operation. Rotate all shafts that have bearings on at least a monthly basis.
- D. The unit shall be erected and lubricated in strict accordance with the installation instructions.

PART 2 PRODUCTS

2.01 GENERAL

A. The equipment furnished shall positively clean and remove debris from the incoming wastewater by means of a bar rack, installed in a concrete channel designed to retain debris. A traveling chain and raking mechanism removes and elevates the debris to a discharge scraper mechanism. The bar rack shall be cleaned by multiple rakes engaging the upstream side bar rack from the bottom of the channel and removing the debris. The debris shall be lifted above the top of the channel and discharged through the downstream side to a screenings conveyor.

B. The mechanically cleaned multiple rake bar screen system shall be fully automatic and shall consist of the following components:

| | |
|---------------------------------------|----------------------------|
| Bar Rack | Frame, Supports and Guides |
| Dead Plate | Drive Machinery |
| Discharge Chute | Anchor Bolts |
| Wiper Assembly | Rake & Chain Assembly |
| Electrical Controls and Control Panel | |

In addition, any other components required to provide a system, which will be capable of fully performing the functions specified.

C. The design shall be such to ensure that all manufacturer recommended preventive maintenance to the bar screen can be accomplished at the operating floor level.

D. The equipment shall be designed and built for 24-hour intermittent service and for moderate shock without overheating, excessive vibration or strain.

2.02 FRAME ASSEMBLY

A. The side frames shall be formed from plate with engineered bends and provided with bracing to form a rigid assembly capable of withstanding all operating forces when installed in accordance with manufacturer's instructions.

B. The frame shall be manufactured of 316 stainless steel plate, having a minimum thickness of 1/4-inch. The frame shall have a minimum width of 28-inches and extend fully from the bottom of the channel to the top of the bar screen assembly.

C. Each side frame shall include chain guides attached to the frame to

align the rake teeth into the screen bars and maintain engagement in the bar rack. The chain guides shall assist in deflecting flow and solids away from the chain and lower guides to minimize materials from collecting on the guides and chain. The chain guides shall be manufactured of 316 stainless steel.

2.03 RAKE & CHAIN ASSEMBLY

- A. The rake and chain assembly shall consist of multiple rakes attached to the roller links of the roller chain. The roller chain shall engage onto adjustable upper sprockets and fixed lower guides on each side of the screen.
- B. The upper sprockets shall be key mounted onto a drive shaft. The sprockets shall be of the pitch and width to match the roller chain and shall have a 316 stainless steel hub and sprocket teeth.
- C. The lower guides shall be bolted to the side frames and shall provide positive engagement of the rake teeth into the bar rack. The lower guide rail bearing assembly shall consist of a field replaceable stainless steel hub with an integral abrasion resistant polymeric bearing surface. The lower guides shall be a self-lubricating design. The lower guides will be replaceable without removing the screen from the channel.
- D. Rake drive chains shall be 125mm pitch, 70mm roller diameter and 6mm link plates rated for a maximum of 24,000 lbs. operating force. Link plates shall be 316 stainless steel. Rollers and bushings shall be heat treated 17-4PH series stainless steel.
- E. The rake teeth shall be precision cut from ½-inch thick plate in the shape to properly engage the clear space openings in the bar rack. The rake teeth shall engage the bar rack a minimum of 50 percent of the bar depth. The rake teeth shall be made in removable / replaceable sections and attach to the rake shelf. The rake teeth and rake shelf shall be 316 stainless steel.

2.04 DRIVE ASSEMBLY

- A. The bar screen shall be provided with an integrated drive assembly consisting of a Class 1, Division 1, Group D explosion-proof electric motor and helical worm gear reducer. The drive motor and gear reducer shall be mounted on the drive shaft and the frame. The drive shaft shall operate in a grease-able bearing mounted on the external side of the frame. The entire drive assembly will be

- supported by adjustable jacking plates mounted on the exterior of the frames to provide rake alignment and proper chain tension.
- B. The electric motor shall be close-coupled to the reducer. The motor shall be 3 horsepower with a service factor of 1.0. Electrical characteristics shall be 230/460 volt, 3-phase, 60 Hertz, Class F/B rise insulation, 40 degree C Ambient, inverter duty.
 - C. The gear reducer shall be of the helical worm gear type and shall be capable of elevating the weight of the rake and chain assembly plus its maximum calculated debris load.
 - D. Gear reducers shall have ball or roller bearings throughout with all moving parts immersed in oil.
 - E. Helical gears shall be of alloy steel with threads precision ground and polished after casehardening.
 - F. The worm gear shall be high strength alloy bronze.
 - G. Gear shafts shall be of high strength alloy steel ground to required tolerances.
 - H. All ball or roller bearings shall be rated and manufactured by a member of the Antifriction Bearing Manufacturer's Association. At least one bearing on each shaft shall be of the combined radial and thrust type.
 - I. Gear reducer units shall meet the standards of the AGMA for such equipment under moderate shock, 24-hour service with a minimum service factor of 1.25.
 - J. The output capacity of the gear reducer shall be equal to the motor horsepower less reducer losses at the rated service factor.

2.05 BAR RACK

- A. The bar screen shall be provided with a removable bar rack. The bar rack shall consist of equally spaced, parallel bars having 1/2-inch clear spacing between each bar. The bars shall be straight and inclined at 85 degrees above the horizontal plane.
- B. The bottom of the bars shall be curved and attached to a flush bottom, base plate. The bar rack shall extend from the base plate to the connection point on the dead plate.

- C. The raking mechanism shall engage the bottom most portion of the bar rack prior to reaching the inclined section of the rack.
- D. Bar racks shall not require a recess in the bottom of the flow channel.
- E. The inclined section of the bar rack shall consist of trapezoidal bars that shall be 5/16-inches thick by 3/16-inches thick by 1 1/2-inches deep. The bars shall extend 12-feet 0-inches above the channel invert.
- F. The bar rack shall be manufactured of 316 stainless steel.

2.06 DEAD PLATE

- A. The bar screen shall be provided with a fixed dead plate extending from the upper portion of the bar rack connection to the screenings discharge point.
- B. The plate shall be flat without undulation so that the rake head teeth will ride no closer than 1/16-inch from the dead plate and no further than 1/4-inch from the dead plate. It shall be securely fastened to the side frames.
- C. The dead plate shall be manufactured of 316 stainless steel having a minimum thickness of 1/4-inch.

2.07 DISCHARGE CHUTE

- A. The rakes shall be designed to reach a predetermined discharge height above the floor elevation. A directing (discharge) chute positioned a minimum 45 degrees from horizontal and located at the top of the dead plate shall be a part of each bar screen.
- B. A full discharge chute enclosure shall be provided. The enclosure shall be manufactured of 10-gauge 316 stainless steel and shall be provided with an access door to facilitate wiper inspection and replacement.

2.08 WIPER ASSEMBLY

- A. A pivoting wiper mechanism will be positioned at the point of discharge and shall have a replaceable ultra-high molecular weight polyethylene (UHMW) wiper blade.
- B. During each cycle, the wiper blade shall contact the rake heads at its inner surface during upward travel and shall scrape the debris off

the end of the rake head and through the discharge chute. The entire wiper mechanism including the wiper arms shall be fully contained inside the framework of the bar screen.

- C. The wiper mechanism, excluding the wiper blade, shall be manufactured of 316 stainless steel. No moving parts shall extend beyond the framework or the discharge chute.
- D. The design shall be such that the rake repositions the wiper mechanism. The wiper mechanism design shall allow the rake assembly to be operated in reverse, through the wiper mechanism, without the need to manually lift the wiper assembly.
- E. The grease fittings for the wiper arms shall be extended and secured to the side frames in an area where they can be easily accessed by plant personnel.
- F. Shock absorbers shall be provided to cushion the release of the wiper.

2.09 FRAME ENCLOSURES

- A. The bar screen shall be provided with removable enclosure panels on the upstream portions of the bar screen above the operating floor.
- B. The removable enclosure panels shall be provided with engineered bends. The panels shall be manufactured of 20-gauge 316 stainless steel held in place by latches. Each panel shall be provided with two (2) handles for panel removal / replacement. All handles and latches shall be 316 stainless steel.

2.10 FASTENERS

- A. All fasteners shall be 316 stainless steel unless otherwise indicated in this specification. All threaded fasteners shall be coated with a nickel based anti-seize thread lubricant prior to assembly.

2.12 ANCHOR BOLTS

- A. All anchor bolts shall be 316 stainless steel unless otherwise indicated in this specification. Anchor bolts shall be ample size and strength for the purpose intended and as shown on the Contract Drawings.

2.13 CONTROLS / INSTRUMENTATION

- A. The control system description, Sequence of Operation, wiring diagrams and list of components can be found in submittal Section 5

or operation manual Section 7.

2.15 LUBRICATION

- A. The manufacturer shall state in the operating manual the amount of and specification for any lubricant required.

2.16 PROTECTIVE COATINGS

- A. Stainless steel and plastic components shall not be painted. The stainless steel structural components shall be passivated after fabrication to remove embedded iron, surface rust and weld burn.
- B. All other surfaces shall be solvent cleaned to remove dirt, oil and foreign materials. Cleaned surfaces shall be shop primed with one (1) coat of TNEMEC Series N69-1212 primer, or equal, to attain a minimum dry film thickness of 2.5 mils.
- C. The motor and gear reducer shall be finish coated with two (2) coats TNEMEC Series 1074 Endura-Shield, or equal, to attain a total minimum dry mil thickness of 5 mils.
- D. Non-stainless steel controls panels shall have manufacturer's standard paint finish.

2.17 SPARE PARTS

- A. The Manufacturer shall furnish the following spare parts as the total amount of spare parts for this specification section.
 - 1. Four (4) wiper blades
 - 2. Four (4) 5-foot sections of drive chain
 - 3. Four (4) proximity switches
- B. All spare parts shall be properly packaged, labeled and stored where directed by the Owner or Engineer.

PART 3 EXECUTION

3.01 TESTING

- A. The screen shall be factory assembled and factory run tested for a minimum of 8 hours. The main control shall also be factory tested.
- B. The screen shall also be field tested after erection in the presence of the Owner and Engineer to confirm and verify the structural and mechanical

compliance to the specification. The field acceptance test shall include demonstrating that the rake teeth properly engage the bar rack along the length of the bar rack and that the screen can be run continuous for 4-hours without overheating.

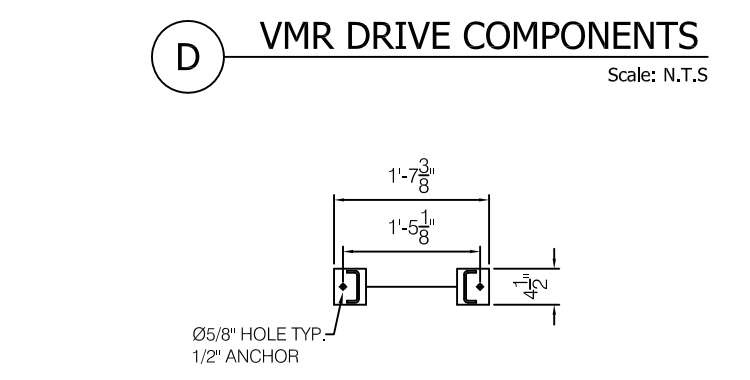
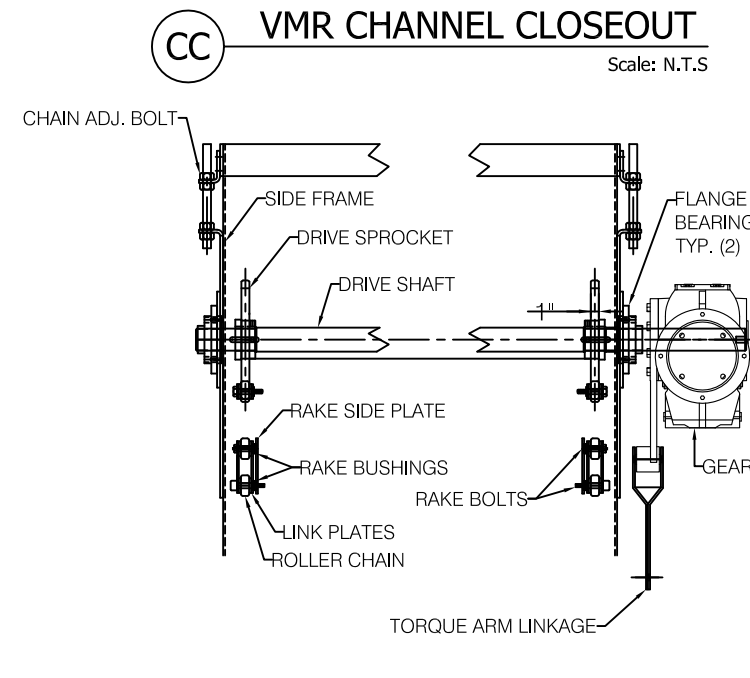
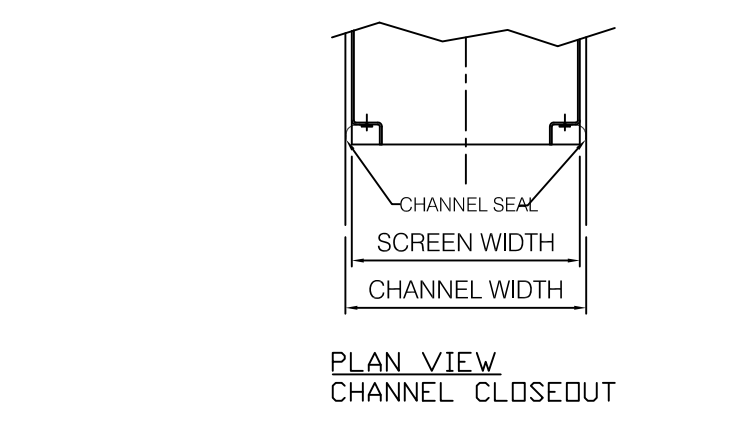
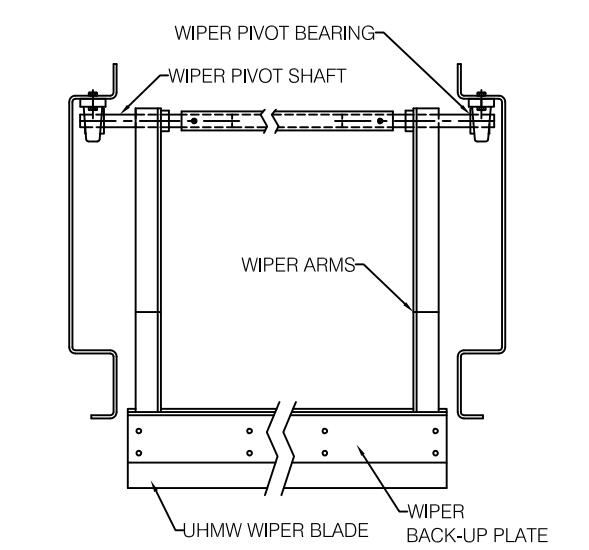
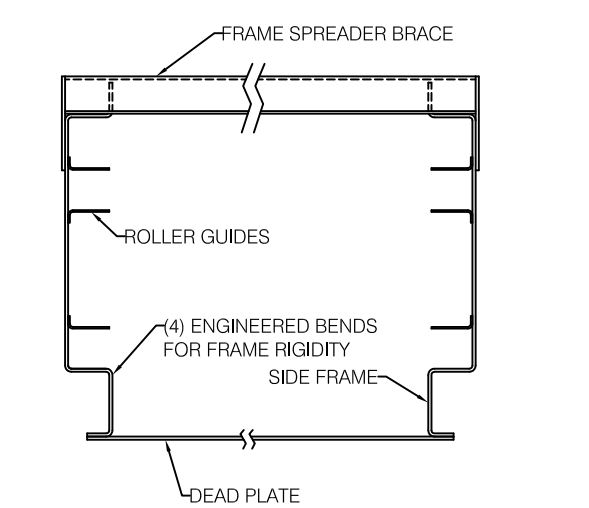
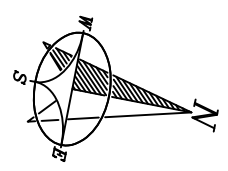
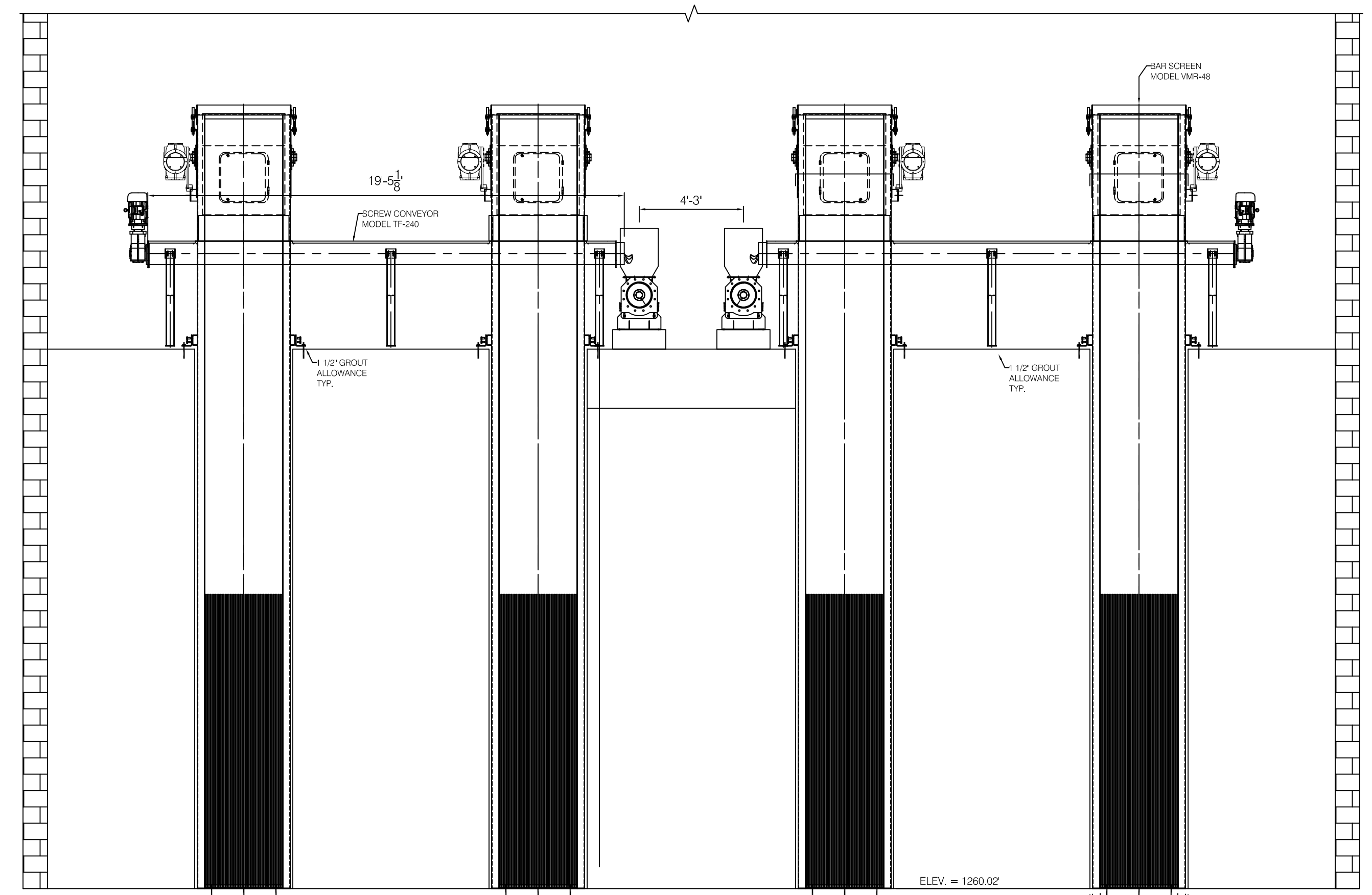
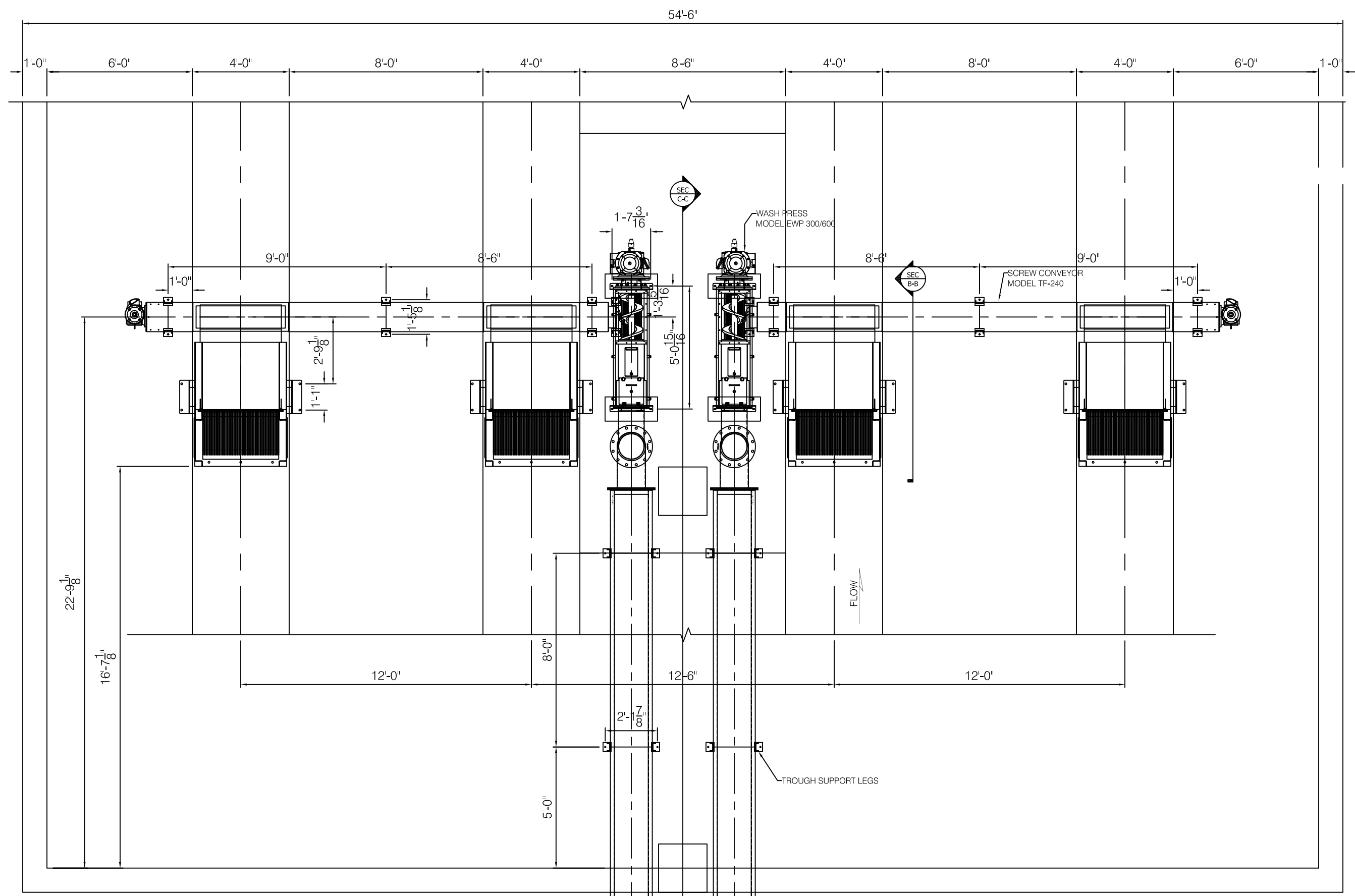
3.02 INITIAL START-UP AND TRAINING

- A. The services of a factory-employed service technician shall be provided to inspect the installation, test the equipment furnished under this Contract and instruct the Owner's operating personnel in its maintenance and operation. The services of the technician shall be provided as follows:
1. Two (2) trips, total of three (3) 8-hour days of service to inspect and certify the installation prior to startup and provide Owner's personnel in proper operation and maintenance of the equipment.
 2. Start-up service and training for the bar screen will be combined with the service for the washing presses and conveyors.

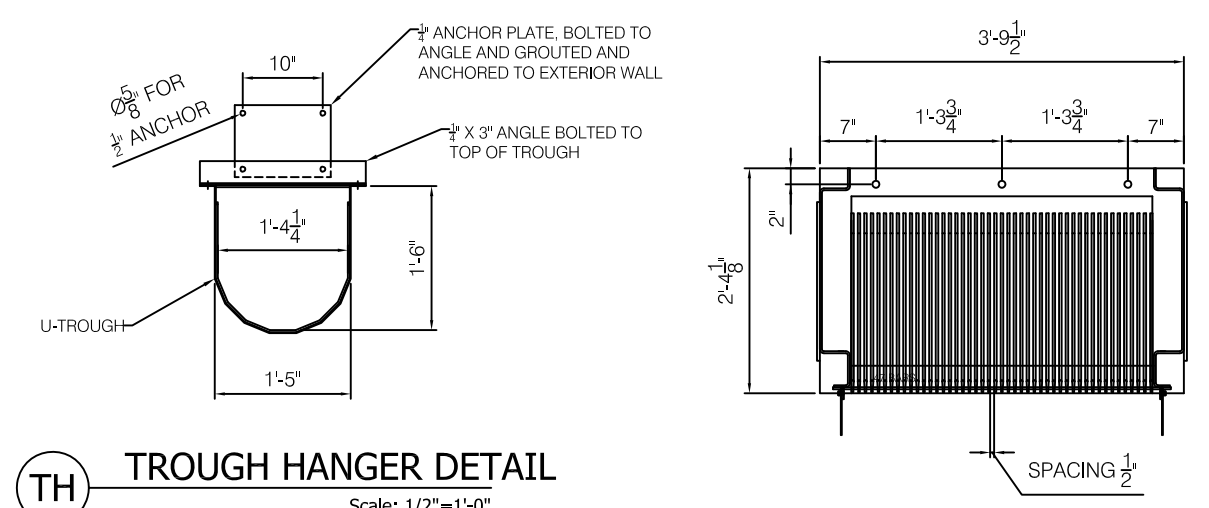
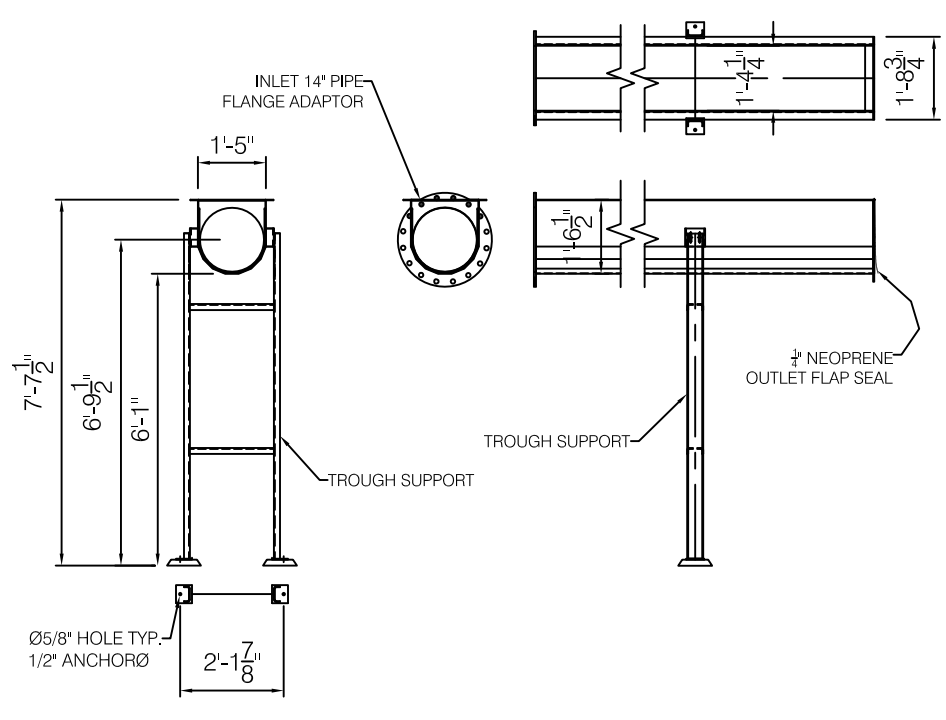
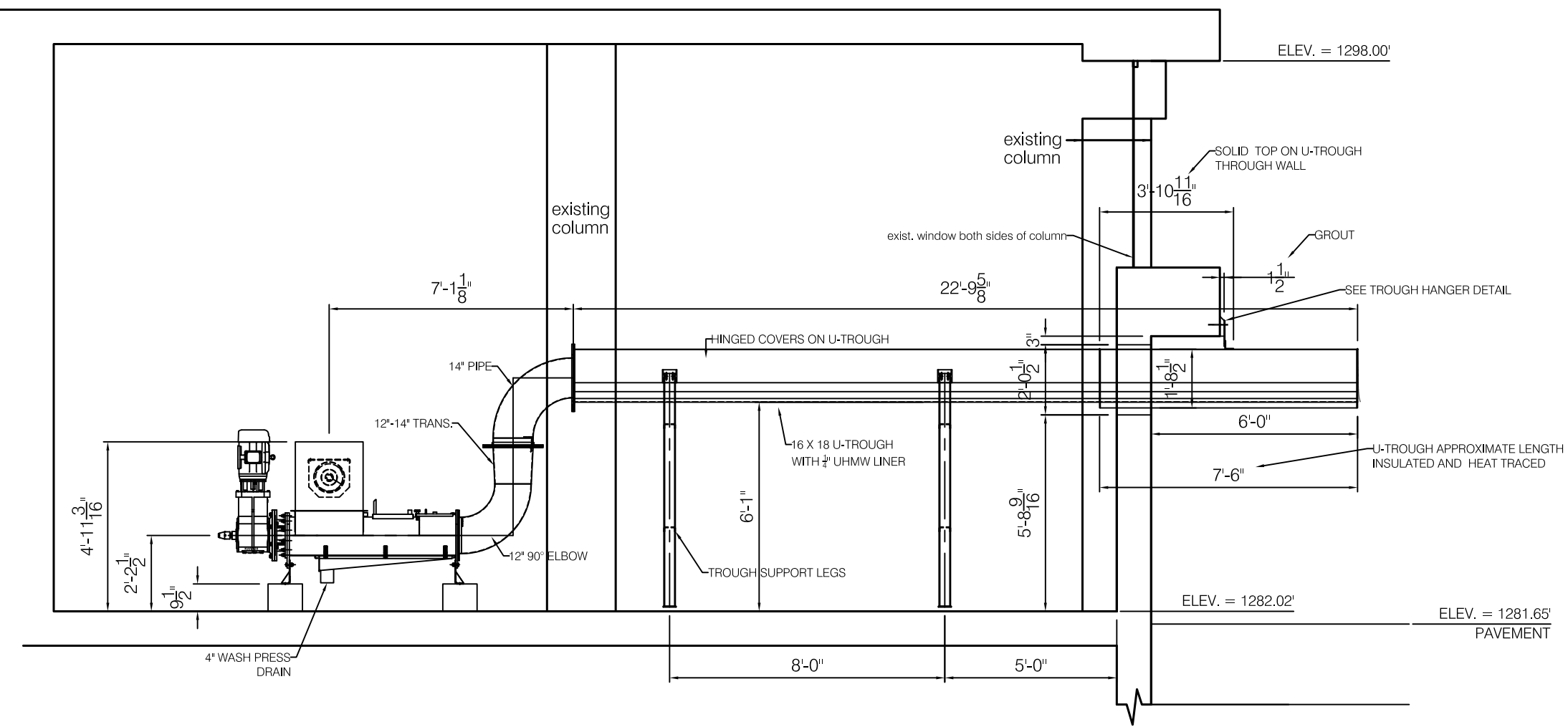
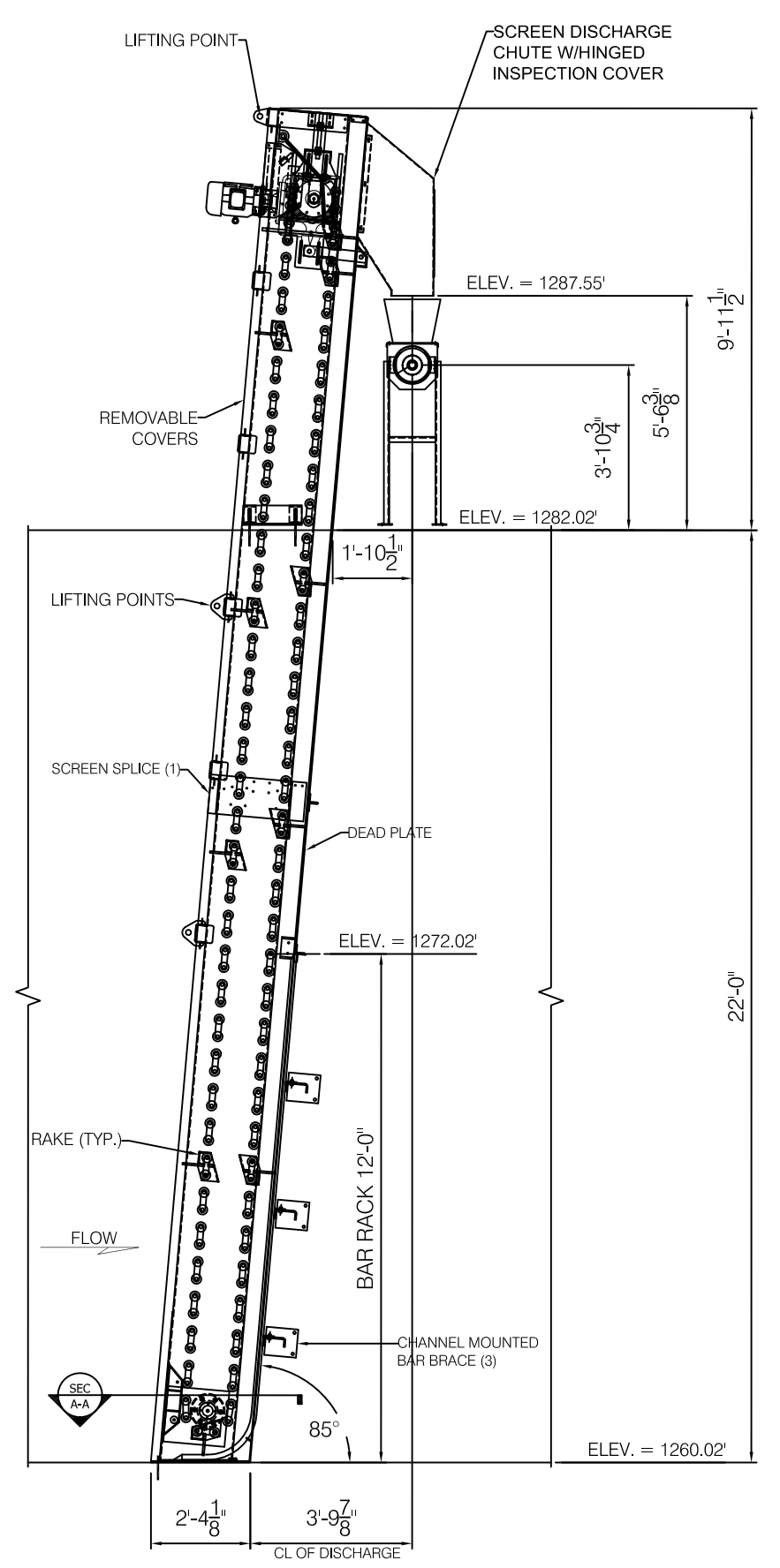
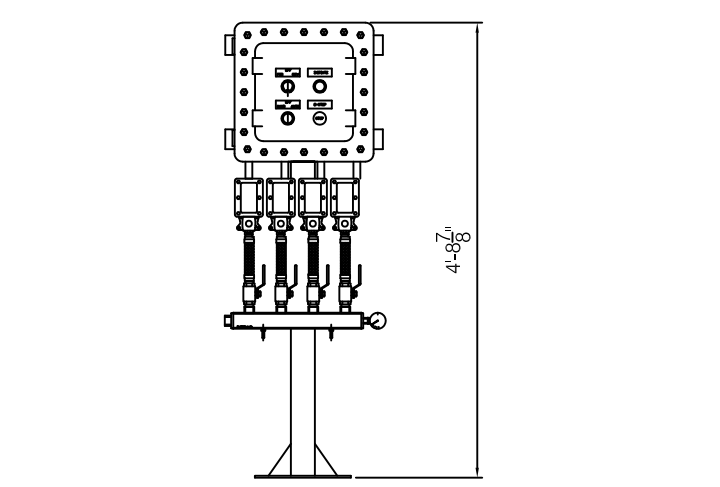


Section 8 Project Data

8.3 General Arrangement Drawing (See the following pages)



** ALL DIMENSIONS AND ELEVATIONS ON THIS DRAWING TO BE VERIFIED.



| | | | |
|---|--------------------------|---|-----------------|
| Vulcan THE PAPER SCREEN CHIEF | | 212 SOUTH KIRLIN STREET MISSOURI VALLEY, IA. 51555 712-642-2755 www.vulcanindustries.com | |
| SCALE: 1/4"=1'-0" | DATE: 7/15/2019 | SHEET NUMBER: 1 OF 1 | DRAWN BY: THB |
| TITLE: GENERAL ARRANGEMENT | PROJECT NUMBER: 19177 | REVIEWED BY: JDF | DATE: 7/15/2019 |
| PROJECT: WICHITA, KS | DRAWING NUMBER: 19177-GA | | |

| REV | DATE | BY | DESCRIPTION |
|-----|------|----|-------------|
| | | | |



Section 8 Project Data

- 8.4 Start-up Documents**
To be inserted by Contractor after Installation
(See the following pages)



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Section 1 General Safety Instructions

1 General Safety Instructions

1.1 Operator's Responsibilities

This machine was designed and built to operate within all applicable safety guidelines. In practice, however, this safety can only be achieved if all the necessary measures are taken. It is the responsibility of the owner and/or operator to ensure these measures are taken and to monitor their performance.

The operator must ensure that:

- The machine is used only as directed in this manual.
- The machine is in good working condition and the safety devices are checked regularly for their operability.
- The required personal safety gear for operating, maintenance and repair is available and is used.
- The operating instructions are available in legible condition and in complete form.
- Only adequately qualified and authorized personnel operate, maintain and repair the machine.
- All the safety and warning signs attached to the machine are in place and remain legible.
- All doors, panels, covers, and guards are closed or secured in place.

1.2 Safety Measures

A. Keep Information Available

Keep these operating instructions in an easily accessible location. Ensure that everyone working on the machine can access the operating instructions at all times.

Keep all safety signs and instruction plates on the machine in legible condition. Immediately replace signs that have become damaged or unreadable.

B. Bio-hazardous Materials

When operating the machine, especially when performing maintenance and upkeep, it is imperative that you comply with applicable instructions and guidelines on safety, occupational medicine and hygiene. The medium processed by the machine falls under the category of:

“Biologically Hazardous Material”!



Section 1 General Safety Instructions

C. Before Switching the Machine On

Familiarize yourself with the following:

- The operating and control elements of the machine.
- Machine equipment.
- The mode of operation of the machine.
- The immediate surroundings of the machine.
- The safety devices on the machine.
- Emergency measures.

Then perform the following:

- Check and ensure that all safety devices are attached and functioning.
- Check the machine for visible damage. Immediately rectify defects or report them to supervising personnel. Operate the machine only when it is in good working condition.
- Ensure that only authorized personnel remain in the area of the machine and no one might be injured when the machine is activated.



Caution: Automatic Equipment! When the machine is activated, it can run in automatic mode. It can start automatically at any time.

D. During Normal Operation

Do not remove or deactivate any safety device while the machine is running.

Do not operate the machine with guards, doors, panels or covers removed.

E. During Maintenance

Perform the maintenance work prescribed in the operating instructions – adjustment, cleaning, lubrication, upkeep and inspection – within the suggested maintenance schedule.

Take note of special requirements for individual components in these operating instructions.

Before performing maintenance work:

- Disconnect the power supply. Follow all Lock-Out/Tag-Out procedures in place for the worksite. Note that control panels may have more than one source of power.
- Ensure that all parts of the drive have cooled down to room temperature.
- Ensure that appropriate hoisting gear and load suspension devices are available when large machine parts have to be replaced.
- Bar access to the work area of the machine and ensure that no unauthorized people remain in it.
- Replace machine parts that are not in good working condition.



Section 1

General Safety Instructions

- Use only genuine replacement parts from the manufacturer.
- Ensure that suitable collection containers are available for all substances that are hazardous to ground water (oils, coolants, etc.).

After maintenance work is completed and before switching on the machine:

- Check that all bolted joints previously loosened are securely fastened.
- Check whether all safeguards and covers previously removed are properly installed.
- Ensure that all tools, materials and other equipment used have been removed from the work area.
- Clean the work area and remove liquids that might have spilled.
- Ensure that all safety devices of the machine are functioning properly.

F. Working on Electrical Equipment

Only trained electricians should perform work on electrical equipment of the machine.

Regularly check electrical equipment:

- Reattach loose connections.
- Immediately replace damaged wires or cables.

Always keep the control panel and all electrical supply units closed. Access is allowed only by authorized personnel.

Never clean electrical equipment with water or similar liquids.

G. Environmental Protection

When performing work on the machine, follow the protocol for waste prevention and proper recycling or waste disposal.

Ensure that hazardous substances such as grease, oils, coolants, solvent-containing cleaning fluids, etc. are collected and disposed of in a safe manor and as prescribed by environmental laws.

H. Equipment Modifications

For safety reasons, do not perform any unauthorized modifications to the machine. This also applies to welding work on load-bearing parts.

Vulcan Industries, Inc. must approve all modifications in writing.

Use only genuine replacement parts from the manufacturer. Parts manufactured from a third-party do not conform to the manufacturers design standards. The use of third-party parts and special equipment on the machine could result in catastrophic failures and void the warranty.



Section 1 General Safety Instructions

1.3 Requirements for Operating Personnel



Warning: All operating and maintenance personnel must read and understand these operating instructions before operating and/or performing maintenance to this machine.

A. Operating Personnel

Only personnel who are trained, instructed and authorized to operate the machine may do so. These personnel must be familiar with the operating instructions. In addition, the following qualifications are needed for the following activities:

- Only electricians may perform work on electrical equipment.
- Only trained personnel may perform maintenance, upkeep and repair work.

1.4 Other Dangers

A. Risk of Injury

Do not impede the operating sequence of the machine. Injury from the moving components can occur. Lock-out the machine before performing any kind of inspection or maintenance activities.



Warning: Do not reach into automatic equipment without first shutting down the machine! The machinery can start at any time.

B. Build-up of Hazardous Gasses

Because of the nature of the treatment process, hazardous gasses may form and lead to a deadly atmosphere.

Always take appropriate precautions when operating and/or maintaining equipment in a classified area.



Warning: There is risk of explosion or detonation.



Section 1 General Safety Instructions

1.5 Safety Symbols

The following are pictures and an explanation of all the safety stickers that are used on Vulcan equipment. Some of these may or may not pertain to your particular machine.



A spreader bar must be used when lifting this machine.



Contractor, make sure that the seal off fitting is potted before you close out the job.



Be careful of moving parts when working on the machine. Use proper Lock-Out/Tag-Out procedures.



This part of the machine is not meant to be used as a step. Injury to persons or damage to machinery can result.



Section 1 General Safety Instructions



Grease point for maintenance reference.



Grease point for maintenance reference.



Watch for an open pit.



Equipment in Automatic mode may start if sensors are triggered. Make sure the machine is properly locked-out



Section 1 General Safety Instructions



Do not operate the machine with covers removed.



Take care in not getting caught in the exposed screw or other moving parts.



Section 2 Receiving, Storage & Transporting

2 Receiving, Storage & Transporting

2.1 Receiving

A. Suggested Receiving Practices

Upon receipt of the equipment, locate the packing slip and verify completeness of the shipment. The packing list will clearly indicate the items that have shipped, contents of containers and component weights. Contact Vulcan Industries, Inc. immediately if the received items are not as indicated on the packing slip.

No claims for missing components will be honored if not identified at the time of receipt of the shipment.

Components are generally shipped on skids or pallets, though occasionally they are shipped loose inside the equipment. Do not remove the equipment from the shipping skids or pallets, except as required to inspect the components, and check the scope of supply. Inventory all loose items identified on the packing list.

The skids must be placed on a smooth, level surface. When stored outside suitable cribbing must be arranged to support the skids and their associated weight.

Care must be taken when unloading the equipment from the carrier. Prior to attempting to off-load the equipment:

- Inspect lifting points, rigging and equipment.
- Confirm lifting capacities for all rigging and equipment.

Before unloading and accepting any equipment from the shipping company, thoroughly inspect the equipment and/or packaging for signs of damage. If damage to the packaging is discovered, immediately check the contents for damage.

Immediately show any damage to the shipping company and have it confirmed by their representatives.

2.2 Storage

A. Short Term Storage

The equipment, if possible, should be stored inside in a climate controlled environment.

The major pieces of equipment are shipped on skids or pallets. Do not remove the equipment from the shipping skids or pallets, except as required to inspect the components and check the scope of supply.

The skids must be placed on a smooth, level surface. If stored outside a suitable cribbing must be arranged to support the skids and their associated weight.



Section 2 Receiving, Storage & Transporting

The equipment should be covered with a tarp to protect it from moisture, dust, or other harmful elements.

B. Long Term Storage

If the equipment is to be stored outside for more than one month, the following storage procedures must be followed:

- Drain gear cases completely and refill completely full with a compatible gear oil. Lubrication recommendations may be found in Section 5 of the Operation and Maintenance manual. The gear is normally shipped with a plug installed in the breather port. Make sure the plug is installed and not the breather. Tag the gear “Check Oil Level Before Operating”.
- After storage and before installing the equipment, the following procedures must be followed:
 1. Uncover all electrical components and inspect for corrosion.
 2. The equipment should be washed down completely and thoroughly dried. Inspect for any signs of corrosion.
 3. Drain the gear cases down to the normal fill level. (Note: Some equipment may need to be installed prior to performing this step.)
 4. Follow all lubrication instructions as outlined in Section 5 of the Operation and Maintenance manual.

Follow the normal installation procedures as outlined in Section 3 of the Operation and Maintenance manual.

2.3 Transporting the Equipment

A. Safety Precautions for Transportation

When transporting the machine the following precautions must be taken into account:

- Protruding edges may lead to cuts.
- Suspended loads may fall thus causing mortal danger.



Caution: Never stand under suspended loads!

- Parts that have been stacked too high may tumble.
- Using load suspension devices other than those indicated here could severely damage the machine.
- Flammable packaging material is a fire hazard. Keep away from open flames and do not smoke around this material.



Section 2 Receiving, Storage & Transporting

B. Ground Transportation

Transport the machine only in the original packaging using suitable ground transportation designed for the load and size of the machine. Shipping weights will vary from the equipment weights listed in this manual. Refer to the packing slip for actual shipping weights of the equipment.

Do not place any objects on the machine while it is being transported.

During transport protect the machine against:

- Overturning
- Violent action from the outside
- Mechanical jolts and vibrations
- Humidity
- Effects of heat

C. Suspended Transportation

Transport the machine only in the original packaging while using suitable hoisting equipment designed for the load and size of the machine. Shipping weights will vary from the equipment weights listed in this manual. Refer to the packing slip for actual shipping weights of the equipment.

Use load suspension devices and slings with cross braces as lifting devices.
See Figure 2.3.C



The use of chokers and slings is strictly prohibited!

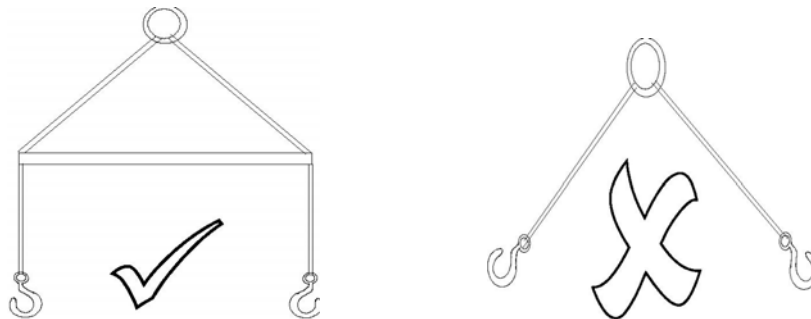


Figure 2.3.C



Section 2 Receiving, Storage & Transporting

Place lifting straps as shown in Fig. 2.3.D. Place straps through clevis connections bolted through the discharge flange and around the thrust bearing. Never lift with the straps around the motor/gearbox, drain pan, mounting feet or inlet hopper as this can damage the machine upon lifting.

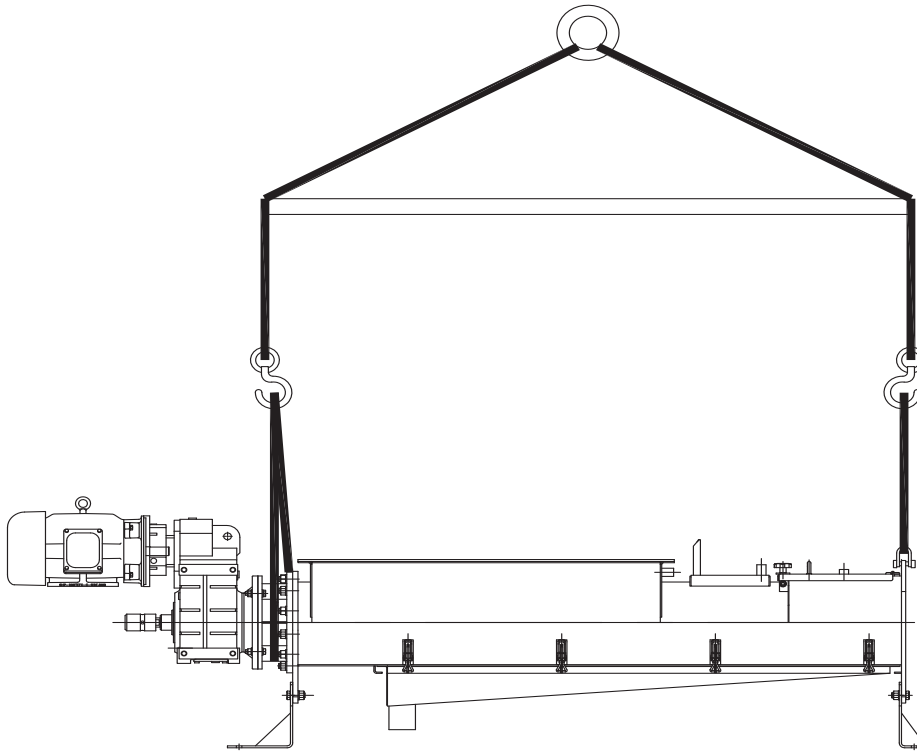


Fig. 2.3.D



Section 3 Installation & Start-up

3 Installation & Start-up

3.1 Installation Instructions

Experienced personnel trained in the installation and operation of this type of equipment must be employed to perform the installation of this equipment. Any questions regarding the installation should be directed to Vulcan Industries, Inc. Installation and Service department. The following steps must be performed in order:

- Inspect and identify components
- Inspect the location
- Machine placement
- Inspect the Wash Water Supply
- Plumb the Valve Manifold
- Mount the gearbox housing vent
- Start-up

Important! Vulcan Industries, Inc. uses all stainless steel hardware and anchor bolts for the assembly and anchoring of the equipment. Vulcan strongly recommends the use of an anti-seize lubricant specifically formulated for use with stainless steel on assembly hardware. Unlubricated hardware has a tendency to seize and cannot be properly tightened. Seized bolts must be replaced.

Bolt Torque:

3/8" 15 Ft. Lb.

1/2" 35 Ft. Lb.

5/8" 50 Ft. Lb.

3/4" 80 Ft. Lb.

A. Standard Erecting Practices

All fabricated equipment manufactured by Vulcan Industries is shop assembled and tested prior to shipping and should not present any abnormal erection problems. Due to varying field conditions, a reasonable amount of fit-up is considered standard erection practice. The use of such tools as "come-a-longs", jacks, drifts, and reamers is to be expected. The equipment should be assembled and installed according to the AISC "Code of Standard Practice". Section 7.12 of that code states:

"Normal erection operations include the correction of minor misfits by moderate amounts of reaming, chipping, welding, or cutting, and the drawing of elements into line through the use of drift pins. Errors which cannot be corrected by the foregoing means or which require major changes in member configuration are reported immediately to the owner and fabricator by the erector, to enable whoever is responsible either to correct the error or to approve the most efficient and economic means of correction to be used by others."

If an erection problem is traceable to Vulcan Industries, Inc. we will work to resolve the problem. If field modifications are done by others to correct the problem, they must be approved in writing by Vulcan Industries, Inc. No back charges will be accepted by Vulcan Industries, Inc. unless the deficiencies are documented and the remedy is approved in writing by Vulcan Industries, Inc.

B. “As Built” Drawings

Vulcan Industries, Inc. provides detailed “AS-BUILT” installation drawings. Drawings should be thoroughly reviewed prior to installing any Vulcan equipment.



IMPORTANT! Always verify the detailed drawing is marked “AS-BUILT”. Drawings not marked “AS-BUILT” may not reflect contract changes to the approved shop drawings required during manufacturing and therefore may be incorrect.

3.2 Inspect and Identify Components

Within the standard scope of delivery, the EWP type wash press consists of the following components:

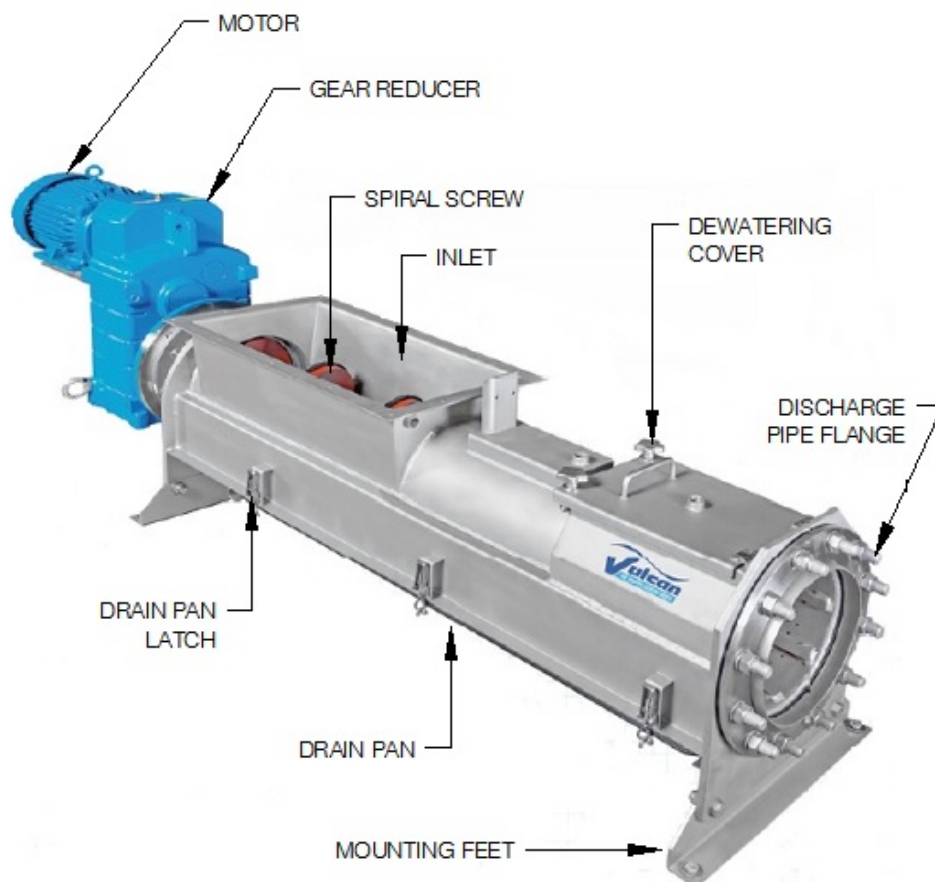


Fig 3.2.A

Inspect the scope of delivery based on the Bill of Lading and the Packing List. Report any discrepancies immediately to Vulcan Industries, Inc.



Section 3 Installation & Start-up

3.3 Inspect the Location

Inspect Location

Check the measurements of the location against the General Arrangement drawings and specifications in Section 8 of this document. Also check the following:

- Check that the location where the press is to be located is level and flat.
- Check that the foundation on which the equipment is to be set is sufficient to bear the service weight of the equipment. (This is required when the equipment feet rest on grating or other channel coverings.)
- The motor and especially its ventilation openings should have a suitable distance (> 4 in.) from other objects.
- Location must not be subject to freezing (unless protective heat tracing has been supplied).
- Location should be sufficiently ventilated.

3.4 Machine Placement

The positioning of the wash press is crucial in that the wash press typically interfaces with other machinery in receiving their discharge material. Improper wash press location can cause interference with moving parts or the inability to properly collect droppings from the machine feeding the wash press. Take the following precautions when installing the wash press:

- Position the wash press per the dimensions shown on the General Arrangement drawing.
- The wash press is generally supplied with mounting feet. Insure that the feet are resting fully on the equipment base, and that the press does not tip or rock. Shim as required to establish a plumb and level state, then anchor the plates to the equipment base.
- Ensure there is adequate clearance for removing the drain pan and opening the dewatering cover.
- Ensure that the spiral can be easily removed from the machine. There must be adequate clearance (length of the wash press not including motor and gearbox) in order to slide the spiral fully out of the drive-end of the machine.
- All flange connections have a mating gasket used to seal the connection. Make sure not to misplace these gaskets.

A. Place and Anchor the Valve Stand (If Supplied)

The valve stand comes with the valve solenoids pre-wired and hose connections from the manifold to the valves attached. As stated in section 3.7, the main water supply connection needs to be made to the $\frac{3}{4}$ " inlet on the manifold, and the controls on the valve stand need to be wired to the main control panel, refer to Section 7 for the schematics on wiring the valve stand. Follow these guidelines when placing and installing the valve stand:

- Ensure the valve stand will not obstruct the removal of the spiral.
- The valve stand should be anchored within a few feet of the wash press, clear of any walkways and without interfering with any moving equipment. Position the stand so the controls can be easily accessible. Valve stands positioned too far from the machine may not have enough hose length to reach all connections.



Section 3 Installation & Start-up

- Route the hoses from the valve stand to the wash press so they are not lying on the floor and crossing over access points or moving components. Make sure the hoses are not crimped and are as straight as possible in their route.
- Make sure the hoses are cut with ample length to avoid being in tension and prevent crimping at the barb connection.

B. Installing Drain Pipe

The drain pipe from the drain pan can be allowed to drain directly into the channel or is plumbed into a drain pipe to be carried off to a basin in a different location. Refer to the General Arrangement drawing to see what type of drain system is being used.

If the drain pipe on the wash press is to be connected to a pipeline the following items should be considered when plumbing the drain pipe:

- Use a coupler to connect the wash press drain to the drain pipe in the floor in order to facilitate drain pan removal.
- Drain piping must be installed with at least a 3° slope to ensure complete draining of wash water and avoid sedimentation of fine sand and fecal matter.

C. Mounting Feet Adjustment

The wash press mounting feet have slotted holes to allow for slight vertical adjustment in raising and leveling the wash press. Properly support the wash press housing as described in Section 2 before loosening the bolts on the mounting feet.

D. Installation of Solids Discharge Pipe

Assemble and install the discharge pipe per the General Arrangement drawing. Locate and anchor any included pipe supports in the approximate area shown on the General Arrangement drawing where the supports will not interfere with any machinery or walkways and can be properly anchored.

If pipe supports are not supplied by Vulcan Industries, Inc. within the project scope, the following criteria should be followed when fabricating supports:

- Pipe supports should clamp the discharge piping securely to keep the discharge pipe from shaking.
- Pipe supports should be anchored securely to the floor or a sound structural member.
- Pipe supports should be strong enough to prevent deflection in the pipe when under a loaded condition.

In installations where freezing can occur, the discharge piping must be heat traced. When installing insulation with electric heat tracing care must be taken to insure that the screenings are not overly heated. Heat tracing must be self-regulating to maintain a temperature between 40 and 60 degrees Fahrenheit.

E. Installation of Inlet Hopper

If supplied by Vulcan Industries, Inc., install the inlet hopper according to the General Arrangement drawing. The hopper will mate up to the inlet opening on the wash press housing by a bolted flange connection.

If the scope of the project does not include a supplied inlet hopper, the following must be incorporated into the design of the hopper:

- The inlet hopper must be designed so that no debris can adhere to the sides.
- The sides should be smooth, water tight, and stand at no less than 50° to horizontal.
- Internal joints must be ground smooth.
- The hopper must act as a guard for the spiral.
- The hopper must follow local, state and federal guidelines for protective guards.
- The hopper should be made as large as feasible to avoid plugging or bridging of screened material.

Contact Vulcan Industries, Inc. for additional questions regarding hopper design.

3.5 Wash Water Supply

Potable or non-potable water may be used for the wash water system. If non-potable wash water is used, it must be free of algae. A Y-strainer with a minimum 180 micron (80 mesh) screen is recommended to prevent particles from clogging the spray wash system. Check and clean the strainer screen after initial start-up and periodically during operation to remove screened particles. Wash water should have a neutral PH. Acidic or basic water is excluded from use. If the wash press supply water comes from a drinking water supply, appropriate back flow devices must be employed to prevent contamination of the water supply. Follow all applicable local, state, and federal codes when designing the anti-backflow system.

To avoid plugging the washing nozzles, the machine must not be operated without an adequate supply of wash water. The water supply must be connected to the manifold as described in Section 3.6. The connection will be a single female NPT connection. The water pressure should be according to the project specifications. If the inlet pressure is higher than the specification, a pressure regulator should be installed on the inlet side of the manifold.

Make all connections (wash water, drain piping, inlet hopper, electrical conduits etc.) without putting strain on the press housing. The frame is not designed to support such piping.

3.6 Plumbing the Valve Manifold

Once the water connection is made to the manifold on the valve stand, the water line connections from the valve manifold to the wash press can be made. There are two common configurations of valve manifolds for the Vulcan wash press; four valves (most common) and two valves. Examples are explained in more detail below in this section. Each point of connection from the valve manifold to the washing press is labeled as shown in Figure 3.6.A.

A. Four Valve Manifold

Figure 3.6.A shows a typical four valve wash press and valve stand configuration. Valve one on the valve stand labeled (V1) is plumbed to the hollow spiral shaft. Valve two (V2) is plumbed to the washing zone, valve three (V3) is connected to the dewatering zone, and valve four (V4) is connected to the drain pan. Refer to the valve stand drawing in Section 7 for specific hose routing for your wash press.

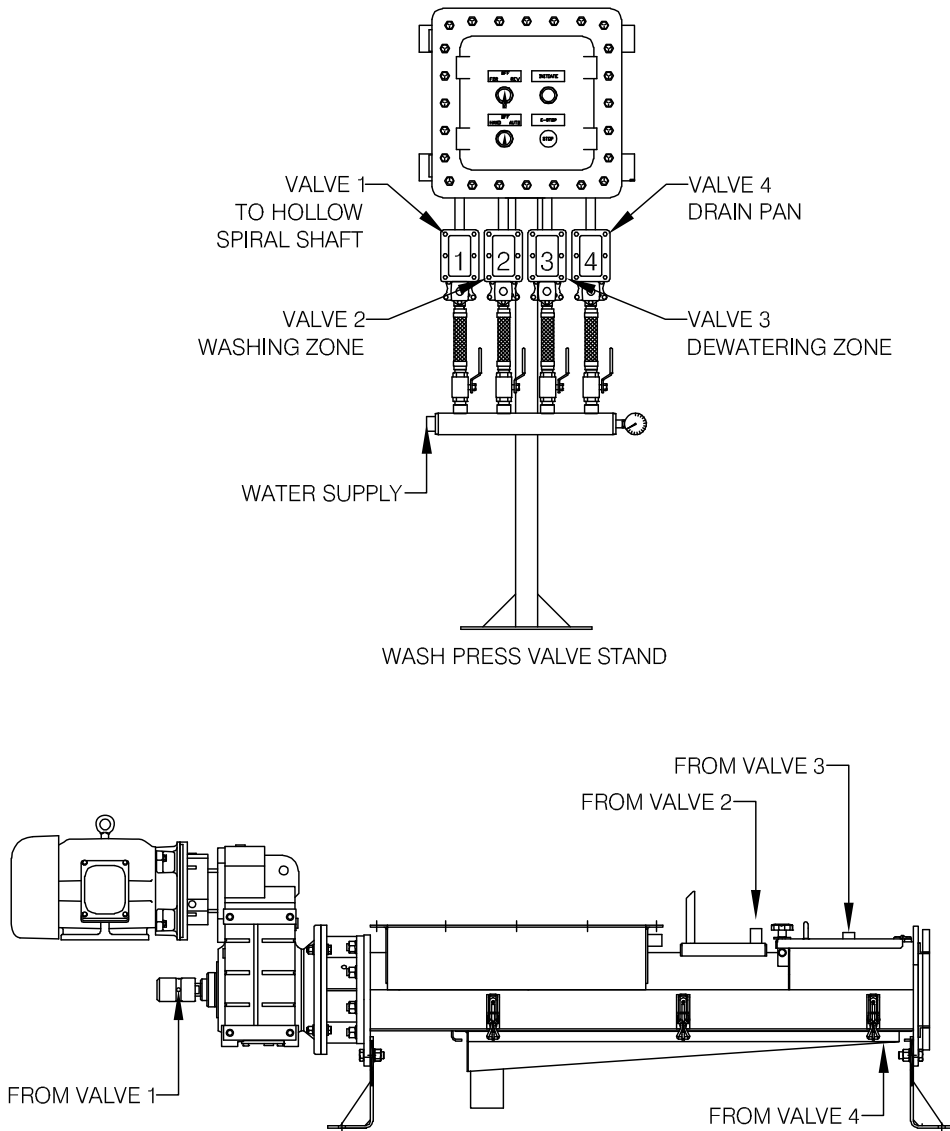


Fig. 3.6.A

B. Two valve Manifold

Figure 3.6.B shows a typical two valve manifold stand and wash press configuration. Valve one (V1) is plumbed to a tee for the hollow spiral shaft and the wash zone labeled on the wash press. Valve two (V2) will connect to the dewatering zone and the drain pan, also through a tee located on the wash press. Refer to the valve stand drawing in Section 7 for specific hose routing for your wash press.

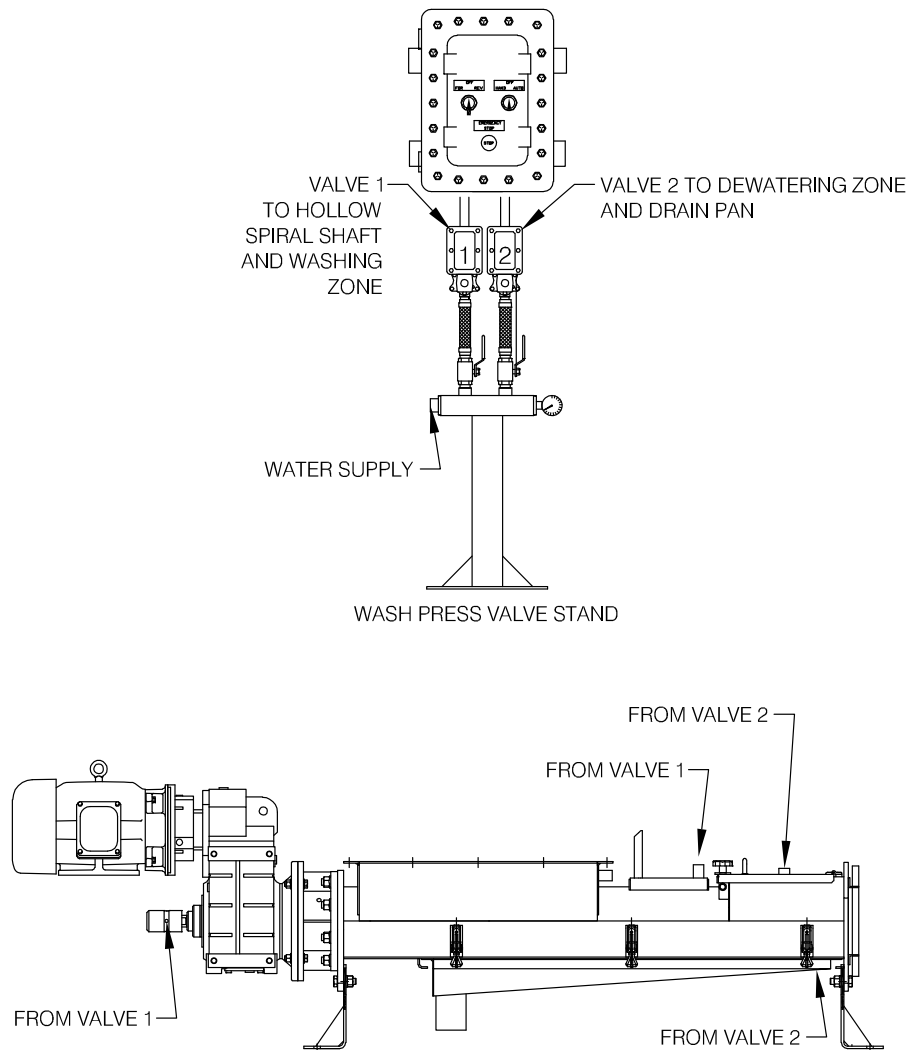


Fig. 3.6.B

3.7 Mounting the Gearbox Housing Vent

The gearbox of the driving unit is filled with oil at the factory. To be sure the oil does not leak during transportation, the vent plug is removed from the gearbox housing and the tapped hole is closed with a plug.

After the screen is set in its final installed position, the plug must be removed and the vent plug must be installed. Please save the removed plug for future use. Check the gearbox for proper oil level.

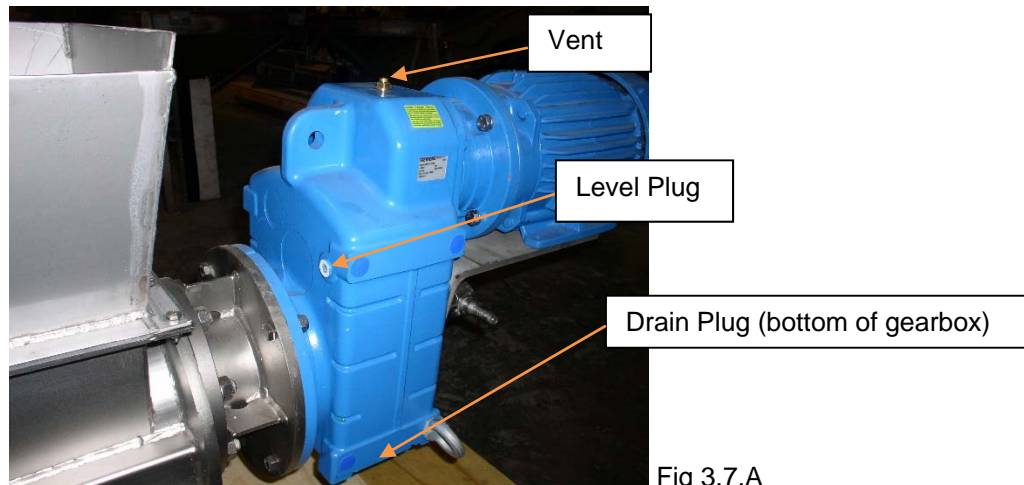


Fig 3.7.A

Figure 3.7.A shows vent and plug configuration for the most common parallel gearbox mounting configuration; the H01. (See Section 6 for motor and gear data and mounting configurations.)

Figure 3.7.B shows vent and plug configuration for the most common right-angle gearbox mounting configuration; the H03.

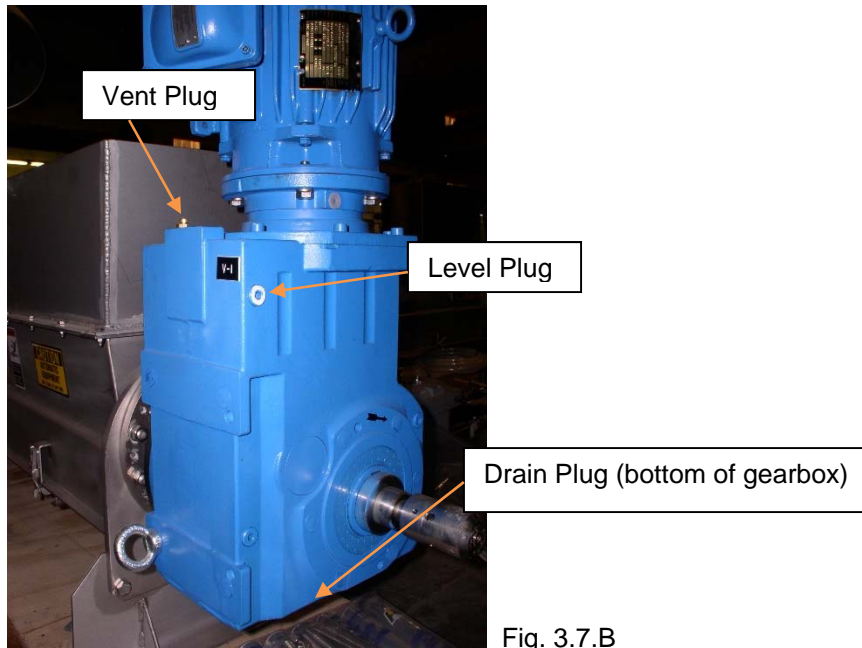


Fig. 3.7.B

3.8 Start-up



Initial start-up is only to be performed by a factory-trained technician. The technician must inspect the installation and provide the client with a certificate of proper installation. Only after the client has such a certificate in hand, may the equipment be started.

Starting the machine for functional check, test run or commissioning is only to be carried out or arranged by a factory-trained technician.

The field connection between the control panel and the wash press local controls must be made in accordance with local, state, and federal electric codes. Consult the Electrical Drawings in Section 7 of this manual for inner-connecting wiring requirements.



Licensed electricians must make the electrical connections.

The following steps must be observed when starting for the first time:

- Check all fasteners for tightness.
- Insure that all packing materials have been removed from the wash press.
- Remove construction debris and other non-typical debris from the screen and channel.
- Install all protective coverings and guards.
- Check that all electrical protection devices (fuses, safety stops, motor starter relay, and current relay) are adjusted and activated.
- Check the oil level in the gear motor. The proper level and type may be found in Section 5 of this manual, according to mounting position and service requirements.
- Check the rotation of the motor. If the direction of rotation is correct, the spiral flank moves towards the discharge area.
- Check for the quality and availability of the wash water and the operability of the wash water valves.

After completion of the above mentioned points the machine may be started.

The operator should check for bulky foreign bodies arriving at the wash press via the wastewater, which could bind up the screw. The wash press must not be exposed to direct frost.



Section 4 Operating Procedure

4 Operating Procedure

Reference Section 7 for project specific control devices and functions.

4.1 Normal Operation

The wash press can be operated manually or in automatic mode.

Starting:

- Insure power is available to control panel.
- Make certain that there are no other personnel working on this unit.
- Establish material flow from the channel screen.
- Place the (Hand/Off/Auto switch or HOA for short) in the desired mode.
- Place the (Forward/Off/Reverse switch or FOR for short) controller into desired position.

Stopping:

- Shut down the operation of the infeed equipment.
- Place the HOA mode controller to "OFF" position.

A. Hand Operation

Hand operation should mainly be used for maintenance purposes. The press can be run by setting the HOA controller to "Hand".

In manual mode, the screw will run in forward or reverse, depending on the position of the FOR selector switch on the local control panel. The forward position is maintained. The reverse condition is momentary unless physically held in the "On" position. The machine should never be run for long periods in reverse. Doing so could force debris past the screw into the bearing housing.

Quick Manual Start-up

The wash press can be run manually by:

- At main control panel, switch disconnect to "on".
- At main control panel, switch wash press control power to "on".
- At local control panel, reset emergency stop device.
- At local control panel, switch hand-off-auto to "hand".
- At local control panel, switch for-off-rev to "for" for forward or "rev" for reverse.

Note: Local control switches may be incorporated into the main control panel. See "Device Functions" in Section 7 for complete electrical sequenced operation and switch locations.

Shut-down

- The wash press can be stopped at any time by pressing the emergency stop device at the local control panel or by turning the HOA to "off".



Section 4 Operating Procedure

B. Automatic Operation

Automatic operation is used as the primary operating mode. The wash press cycle is initiated by a signal from the main control panel by counting the adjoining machine cycles. The wash press will complete a series of running the screw forward and reverse while cycling the solenoid valves during the washing and compacting of the screenings.

A batch mode cycle can be started any time by pressing the “initiate” pushbutton at the local control panel. This function is convenient for evaluating press performance, wash water delivery, timing sequences, and drain conditions.

Quick Automatic Start-up

The wash press can be run through a complete cycle by:

- At main control panel, switch disconnect to “on”.
- At main control panel, switch control power to “on”.
- At local control panel, switch for-off-rev to “off”.
- At local control panel, reset emergency stop device.
- At local control panel, switch hand-off-auto to “auto”.
- At local control panel, press the “initiate” pushbutton to initiate the cycle.

Note: Local control switches may be incorporated into the main control panel. See “Device Functions” in Section 7 for complete electrical sequenced operation and switch locations.

Shut-down

- The screen can be stopped at any time by activating the emergency stop device, or by turning the HOA to “off”.

For long periods of shut down, the discharge pipe should be purged of screenings, which could harden in the pipe and cause blockage when the equipment is restarted. The pipe can be purged by running ice through the press until all the screenings are purged. The ice in the pipe will melt and go down the drain.

4.2 System Regulating and Control Procedures

Wash water to each solenoid is regulated by manual ball valves located ahead of the solenoid valves. The valves should normally be run “fully open” unless the water pressure and flow are very high. The ball valves can be used to throttle the flow to each valve.

The machine is protected from operational damage by a current sensing relay incorporated into the main control panel. The relay monitors motor current. If the current reaches the pre-set level, the machine will stop, reverse, stop and continue with the cycle. This sequence will repeat for three cycles if necessary. If the obstruction is not cleared within the three cycles, the wash press will stop and an over-torque alarm will be generated.



Section 4 Operating Procedure

The timing of the wash cycle is automatic and controlled by the internal PLC at the main control panel. The functions of the cycle that are adjustable are noted in Section 7. The adjustable functions are accessed through the operator interface on the front of the main control panel.

4.3 Protective Devices

A. Common Protective Devices (See Section 7 for supplied devices)

- High Torque Protection: A Current Sensing Relay (CSR) is used to monitor two phases of the three-phase motor circuit. When the motor has exceeded the CSR set point, the CSR will de-energize the motor starter, thus stopping the motor. The CSR is adjusted at the factory.
- Solid State Motor Overload Device: The motor starter utilizes solid-state circuitry for three-phase motor protection from things like phase-loss, short circuiting, etc.
- Motor Thermals (If supplied): The motor has heat sensing thermals imbedded in the windings. When any of the thermals overheat the motor starter is de-energized, stopping the equipment.
- Fuses and Breakers: Used to provide short circuit protection
- Emergency Stop Devices:
 1. E-stop push buttons: are located on the local control panel and/or the main control panel. Pushing the button in will shut down the equipment, whether in "hand" or "auto" mode. To reset the e-stop, the button must be manually pulled out.
 2. E-stop cables: A continuous cable is drawn around the perimeter of the equipment and connected back to the control box mounted on the machine housing. The cable is in tension and any force on the cable will cause the E-stop switch to activate. To reset the E-stop, the actuator arm must be pushed in and rotated back into position.

4.4 Emergency Stop/Restart

Activate the E-Stop during an emergency situation to immediately stop the machine from operating. Restart the machine by:

- Reset the E-Stop device.
- Restart the machine in the proper operating mode.

5 Machine Maintenance

5.1 Safety Precautions

Vulcan Industries, Inc. will not be responsible for any harm or injury that may result from the improper operation of this equipment or guarantee this equipment if improperly operated or operated without the designed safety features. For your safety when working on this machine, please follow these suggested precautions.

- Only fully trained and authorized personnel should be permitted to enter owner defined boundaries around, within or on any equipment or components that present a potential for injury through a lack of knowledge concerning proper safety precautions.
- Warning signs and labels shall not be removed or obscured at any time.
- Material handled by this equipment may come under the scope of materials classified as “**Bio-Hazardous Material**”. Appropriate precautions must be taken to protect personnel from exposure.
- Protective guards and covers must be in place before operating this equipment.
- Control panels may have more than one source of power. Make sure all potential power sources are locked out prior to performing any maintenance or repair.
- Before attempting removal or repair of the spiral, thrust bearing or motor, the drive assembly must be secured against possible movement.

5.2 Inspections and Preventative Maintenance Schedule



DANGER! To prevent injury or death, do not perform any of the following maintenance functions that require reaching into the machine while the machine is under power. Follow proper Lock-Out/Tag-Out procedures first. Then perform maintenance functions.

A. Daily

When checking machine operability, always look for damaged parts. Damaged components can jeopardize the safety of personnel and equipment. Replace any damaged parts immediately!

- During operation try to observe the following:
 1. Any unusual noises heard as the machine is running.
 2. Any oil leakage from the gearbox.
 3. The motor runs abnormally hot.
- Check obstructions at the inlet due to oversized materials.
- Check the water flow at all water outlets. Check for adequate supply water and adequate flushing. If sediments are found to be hindering the flow, the drain pan must be removed and flushed manually.
- Record hours of run time.

B. Weekly (After 30 Operating Hours)

- Clean the machine. Avoid cleaning electrical components with a water jet to reduce the risk of electrical shock.
 1. Wash off the outside of the machine with a suitable cleaning device. Avoid spraying directly or excessive overspray onto the electric motor.
- Flush the de-watering sieve and the drain pan. (See Figure 5.2.A).
 1. If there is an extraordinary amount of grease in the screenings, more frequent cleaning may be necessary. Dirty screenings are an indication of a plugged de-watering head.

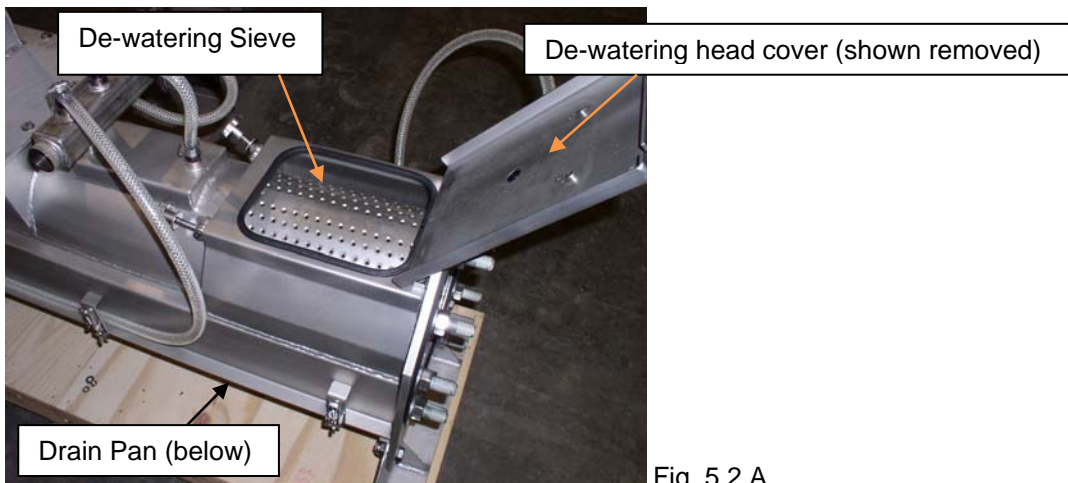


Fig. 5.2.A

B. Monthly (After 100 Operating Hours)

- Lubricate the thrust bearing/seal assembly. (See Fig. 5.2.B). The bearing should be lubricated using a manual grease gun. Pressurized grease fillers are not recommended and their use could damage the seals. Fill the grease chamber until you feel a light resistance. Run the machine for several revolutions “forward” in manual mode. Try to add more grease until you feel resistance again.

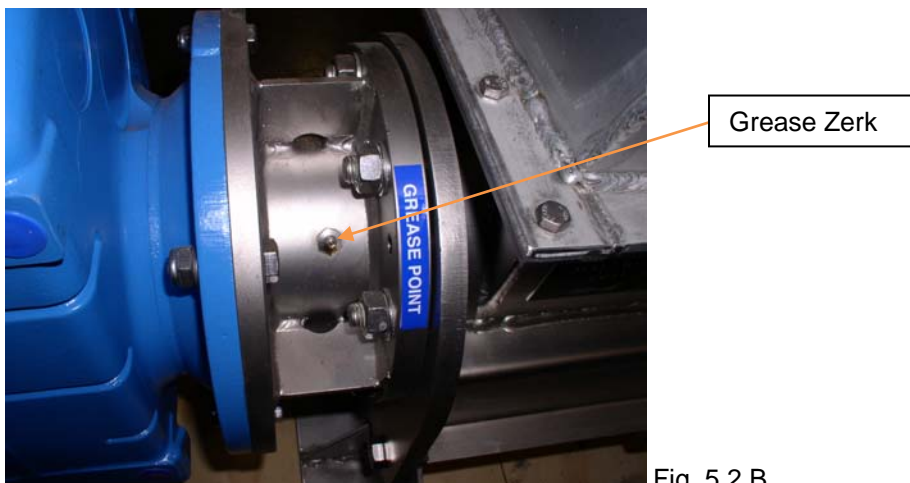


Fig. 5.2.B



CAUTION! Do not overfill the bearing housing. Too much pressure from the grease can damage the seals.

- Check spiral and bearing unit rotation for vibration and noise. If the spiral is found to be rubbing on the slot sieve or rifle bars, it must be adjusted as described in Section 5.6.D.
- Visually inspect the slot sieve at the bottom of the press for deformation or blockage.
- Check cleaning brush on the spiral for wear. Replace the brush as described in Section 5.7.
- Check all safety devices. (See Section 7)

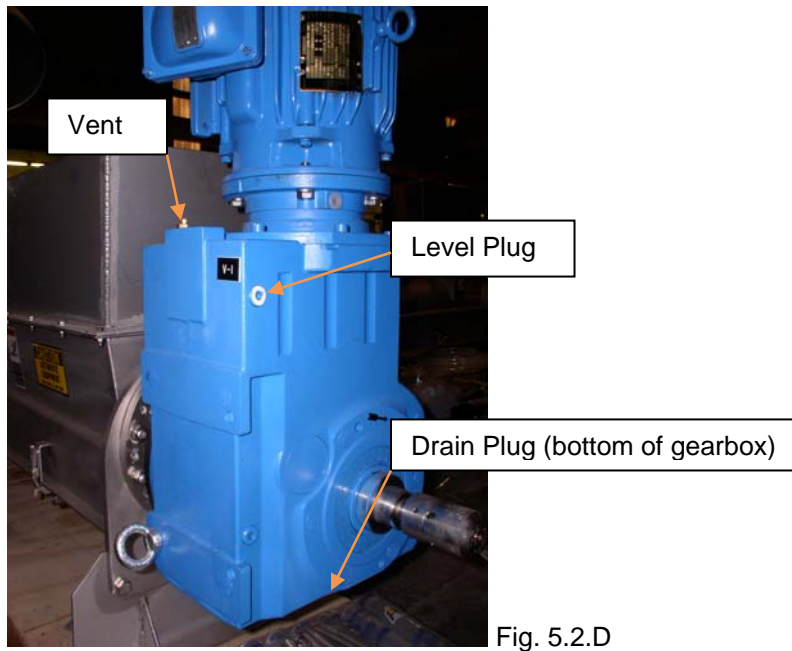
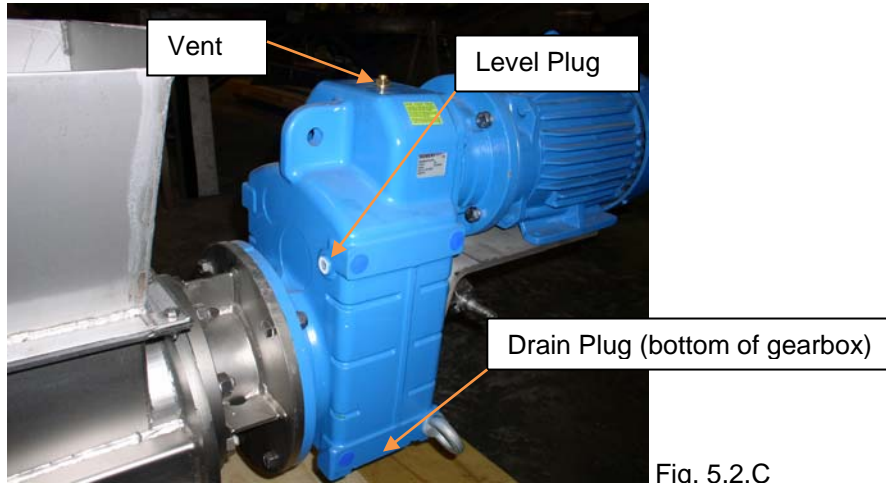
C. Semi-annually (After 600 Operating Hours)

- Check all fasteners for tightness. Tighten all loose fasteners.
- Check all electrical connections for cleanliness and secure fits. Secure all loose connections.
- Visually evaluate the conveying and compacting performance. Make adjustments or repairs to the following items if there is a notable decrease in performance.
- Observe the performance of the water pressure:
 1. Verify that all solenoids are functioning properly.
 2. Verify that the water supply to the valve manifold is adequate. Refer to the machine specs in Section 8 for the recommended water pressure.
 3. Check for leaks in hoses and connections.
 4. Make sure all nozzles are not obstructed. Clean if necessary.
 5. Make sure the dewatering sieve and drain pan are cleaned. Refer to Section 5.2.B for instructions on cleaning the sieve and drain pan.
- Observe the screw press compaction.
 1. If there is material build up on the sieve or between the rifle bars, the spiral may be out of alignment or the spiral brush may be worn. Refer to Section 5.7 for replacing the brush or Section 5.6.D for realigning the spiral.
 2. If there is wear on the top surface of the spiral, the spiral is out of alignment. Refer to section 5.6.D on realigning the spiral.
- Check gearbox oil level and consistency:

For this inspection refer to Figures 5.2.C (parallel motor arrangement) or 5.2.D (right angle motor arrangement).

 1. Lock-out the machine.
 2. Open the drain plug and check the oil for consistency. The oil should smell fresh and not burnt or dirty. The oil should look clear or transparent and not black or gray.
 3. Remove the oil level plug.
 4. Observe the oil level. It should be even with the bottom of the view-hole and readily visible. If oil is not visible from the view-hole, the machine is low and oil needs to be added. Refer to Section 6 for prescribed oils to use. If oil seeps from the view-hole, there is too much and oil must be drained. Allow the excess oil to drain from the view-hole into an appropriate waste oil container until it is level with the view-hole.

- Clean drive and gearbox ventilation
 1. Remove the gearbox vent and clean with air or cleaning solvent. Replace the vent when cleaned.





Section 5 Machine Maintenance

5.3 Maintenance /Lubrication Schedule

| Occurance | Inspection | Activity |
|--------------------------------|--------------------------------|--|
| Daily | Entire Machine | Check operability, leaks |
| | Motor & Reducer | Check motor temperature |
| | Water Supply | Check for proper supply water and flushing |
| | Records | Record run time hours |
| Weekly (30 hrs) | Dewatering Sieve and Drain Pan | Flush out any build up |
| | Entire Machine | Clean the outside |
| Monthly (100 hrs) | Thrust Bearing | Lubricate |
| | Spiral Bearing | Check for noise and vibration |
| | Slot Sieve | Check for deformation or blockage |
| | Spiral Brush | Check for wear |
| | Safety Devices | Check for operability |
| | Semi-annually (600 hrs) | Fastener connections |
| Electric connections | | Check for secure fit, tighten loose connections |
| Evaluate Performance | | Observe water pressure loss and screw press wear |
| Gearbox | | Check oil quality |
| | | Clean vents |
| As recommended by manufacturer | Drive unit | Change oil |



Section 5 Machine Maintenance

5.4 Required Tools

The following is a categorized list of tools to have available when working on this machinery.

Hand Tools:

- Standard maintenance tools (i.e. screwdrivers, allen wrenches, socket, open-end and box-end wrenches up to 1-1/2" and if possible, metric up to 32mm, punches, etc.)
- 18" crescent wrench
- Channel lock pliers
- Tape measure
- Feeler gauge set
- Metric allen wrench set
- Torque wrench with a minimum rating of 100 ft/lbs.
- Voltage / Amp meter

Lifting Devices:

- Lifting device sufficient enough to lift the machine from the channel
- Heavy duty 1/4" cable come-along
- Nylon or cable lifting straps

Safety Devices:

- Lock-out Tag-out as required by local policy
- Hazardous gas detector
- Appropriate work attire and gloves

5.5 Lubrication Instructions

A. Recommended Lubricant Types

These recommendations are not intended to be the only types/brands of lubricants that may be used on this type of equipment. (Lubricants of the same characteristics may be supplemented.)

Manufacturer / Brand

GEAR REDUCER OILS:

- | | |
|---|-----------|
| <input type="checkbox"/> Shell Omala 220 (provided with units, recommended by mfg.) | Petroleum |
| <input type="checkbox"/> Mobil Mobilgear 600 XP220 | Petroleum |
| <input type="checkbox"/> Shell Omala HD220 | Synthetic |
| <input type="checkbox"/> Mobil SHC 630 | Synthetic |

GREASES (multi-purpose)

- | | |
|---|------------|
| <input type="checkbox"/> Mega Blue LC-500, EP-2 (used by Vulcan Industries) | Petroleum |
| <input type="checkbox"/> Mobil Mobilith AW-2 | Petroleum |
| <input type="checkbox"/> Or equivalent AW-2 or EP-2 | Petroleum |
| <input type="checkbox"/> Mobil FM-102 | Food grade |

B. Lubrication Points

The thrust bearing is located between the gearbox and press housing.



Fig. 5.5.A

5.6 Removing and Installing the Spiral, Drive Motor and Thrust Bearing Unit

A. Before Removing the Spiral, Drive Motor and Thrust Bearing Unit:

Refer to Section 1 for proper safety procedures. Perform proper Lock Out/Tag Out procedures before proceeding.



Remember the equipment is controlled automatically and may start at any time. Follow your local “Lock-Out /Tag-Out” procedures to ensure power is disconnected from the equipment before proceeding.

Remove all covers and thoroughly wash the machine with clean water and disinfect all components.

Open the junction box at the motor (see Figure 5.6.A) and disconnect the power leads. Refer to the Electrical Schematic in Section 7. Record the connections for reconnecting the power during reassembly. Cover loose wire ends with wire nuts or other types of insulators. Close the junction box cover.



Fig. 5.6.A

Remove the spiral wash water connection. (See Figure 5.6.B).



Fig. 5.6.B

Support the motor with a lifting device before removing any bolted connections.



CAUTION! The motor, gearbox and thrust bearing are very heavy when handling. Use a lifting device to help assist in lifting any of these items.

B. Removing the Drive Motor

- Remove the bolts on the flange connection that hold the gearmotor to the thrust bearing unit. (See Figure 5.6.C).

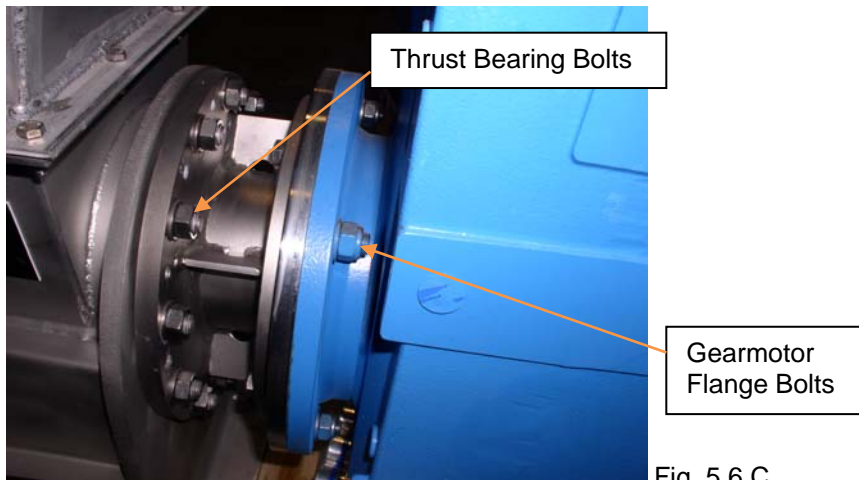


Fig. 5.6.C

C. Removing the Thrust Bearing Unit and Spiral

- Remove the flange bolts that hold the gearmotor to the thrust bearing unit. (See Fig. 5.6.C).

- Remove the flange bolts that hold the thrust bearing unit to the wash press housing. (See Figure 5.6.C).
- Remove the thrust bearing unit along with the spiral.
- Remove the bearing unit from the spiral. The spiral slides off of the thrust bearing unit. Clean the spiral thoroughly to prevent damage to the seals of the bearing unit.
- Check the spiral for wear. Replace brushes that are worn down to the spiral diameter. Replace spirals that are worn down past 5/16-inch of the nominal spiral diameter. (See Section 5.7 for brush maintenance).
- Remove the shaft seals and thrust bearing from the bearing housing. Inspect the bearings for wear and replace as needed. Replace all seals.

D. Installing the Spiral, Drive Motor and Thrust Bearing Unit:

- The thrust bearing unit should be ready to be installed with new seals in place and new bearings (if necessary).
- Install the spiral into the housing. The shaft on the spiral mates with the thrust bearing and should be orientated towards the motor-end of the machine.
- Slide the bearing unit onto the shaft and bolt it to the housing. Do not tighten the mounting bolts, leave them snug. (See Figure 5.6.C).
- Install the gearmotor onto the shaft and bolt it to the thrust bearing unit. Tighten the bolts to 45-56 ft. lbs. of torque. (See Figure 5.6.C).
- Open the junction box at the motor and reconnect all the leads. (Refer to the wiring diagram in Section 7 and any notes that were made at tear-down.) (See Figure 5.6.A).
- Set the operating switch at the main control panel to “Local-Manual”. Make sure that the machine cannot be switched on automatically. Set the “F/O/R” switch to “Forward”. Jog the motor for a few seconds to determine if the screw rotates in the proper direction. The screw should rotate clockwise when looking from the drive end towards the discharge end of the machine. If not, the leads to the motor are reversed and need to be switched (refer to Section 7 for the wiring schematic.)
- Run the press forward a few turns to check for unobstructed rotation. The spiral should not touch the slot sieve or rifle bars but have at least 1/8 inch of clearance all around.



CAUTION! Only a few rotations are needed to check for interference. The bearing housing has not been filled with grease at this time.

- If the spiral does not run freely, the axial alignment of the spiral must be corrected. Loosen the mounting bolts on the thrust bearing unit and then turn the adjusting screws as necessary to align the spiral. (See Figure 5.6.D.)
- Tighten the mounting bolts once the spiral is properly aligned.

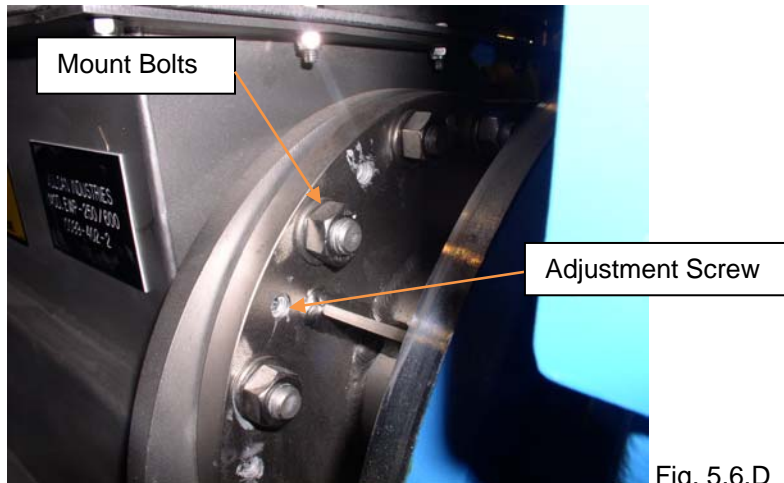


Fig. 5.6.D

- Lubricate the thrust bearing/seal assembly. (See Figure 5.5.B). The bearing should be lubricated using a manual grease gun. Pressurized grease fillers are not recommended and their use could damage the seals. Fill the grease chamber until you feel a light resistance. Run the machine for several revolutions “forward” in manual mode. Try to add more grease until you feel resistance again.

CAUTION

CAUTION! Do not overfill the bearing housing. Too much pressure from the grease can damage the seals.

- Reconnect the wash water hose to the valve for the spray shaft on the spiral.
- Attach all covers and secure them completely. Check all bolted connections for tightness as well.
- Set the wash press to resume normal “automatic” operations.
- After approximately 20 operating hours, check all bolted connections again.

5.7 Replacing the Spiral Brush

If build up of material is found on the slot sieve and around the rifle bars the spiral brushes may need replacing. Also, any time the spiral is being replaced the brush should be replaced as well.

Another indicator of the spiral brush needing to be replaced is when there is an 1/8 inch or less of brush remaining above the top edge of the spiral.

Perform the following steps when replacing the brush: (See Figure 5.7.A)

- Perform the steps in Section 5.6 for removing the spiral from the machine.
- Loosen the set screws in the finger clamps that hold the brush against the spiral.
- Remove the old brush.
- Install the new brush. Start at the drive end of the spiral and wrap the brush around the full length of the spiral, seating the brush in the finger clamps as you go. **IMPORTANT:** Make sure the brush is seated firmly in the finger clamps.
- Cut off the brush at the discharge end of the spiral about 3/8 inch from the last finger clamp.

- Tighten the set screws in the finger clamps.
- Reassemble the spiral as stated in Section 5.6.D.

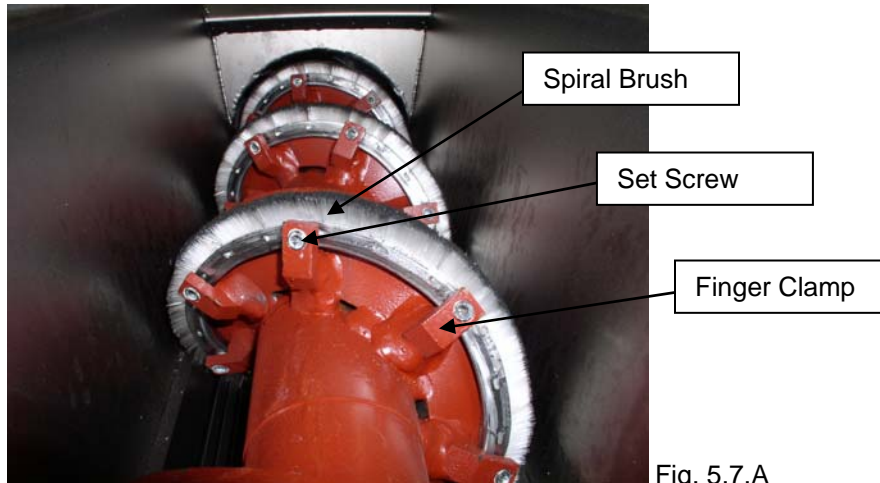


Fig. 5.7.A



Section 5 Machine Maintenance

5.8 Mechanical Troubleshooting Reference

The following table is a list of possible common machine faults, symptoms, and remedies for fixing. These items listed here are only for mechanical issues. For issues with the control system or electrical malfunctions, refer to Section 7.

| Problem | Possible Cause | Solution |
|---|---|--|
| Machine won't start, motor not running | Loss of power | Check incoming power to the control panel* |
| | | Check for control power (110 VAC) out of the control power transformer* |
| | | Check fuses and disconnects* |
| | E-Stop(s) engaged | Check overload devices, safety switches , reset as required* |
| Power available, machine won't start in "Auto", motor not running | No signal to main control panel | Try "Hand" operation. IF machine operates in "Hand", check start signal input devices.* |
| Power available, machine won't start in "Hand", motor not running | E-Stop(s) engaged, Motor Bad | Check E-stop device(s)* |
| | | Check and replace the motor |
| Power available, machine won't start in "Hand", motor running | Breakdown in Power Transmission | Check drive components; isolate faulty component and repair/replace as required. |
| Screenings are wet or dirty | Not enough wash cycles | Increase number of wash cycles.* |
| | Plugged dewatering cylinder | Remove access cover and drain pan, flush and clean all areas. |
| | Clogged drain line | Clean out drain line. |
| Motor trips out on "Overload" while pressing | Current sensing relay set too low | Increase setting on relay, but not to exceed motor full load amps.* |
| | Screenings plug stuck in discharge pipe | Tap on pipe to determine location of plug, disassemble piping where necessary and unplug piping. |
| | Motor Starter overload set too low | Increase setting on starter, but not to exceed motor full load amps.* |

*Refer to SECTION 7 for more detailed information on this subject.



Section 6 Parts Lists & Vendor Data

6 Parts Lists & Vendor Data

At Vulcan Industries, Inc. we do our best to service all our machinery in the most expedited manner. If you require replacement parts for your machine, you can contact our service department at:

Vulcan Industries, Inc.
212 S. Kirlin St.
Missouri Valley, IA 51555
712-642-2755
www.vulcanindustries.com

Or email at service@vulcanindustries.com

Normal hours of operation are Monday-Friday 8 A.M. to 5 P.M. CST.

Make sure to provide the following information located on the cover page of this manual:

- The Vulcan Job Number.
- The project or facility name.
- The project or facility location (city & state).
- Machine Model Number.

Also provide any drawing numbers that you are referencing for your part numbers. If you are using the assembly drawings provided on the following pages, use the section heading for drawing reference.

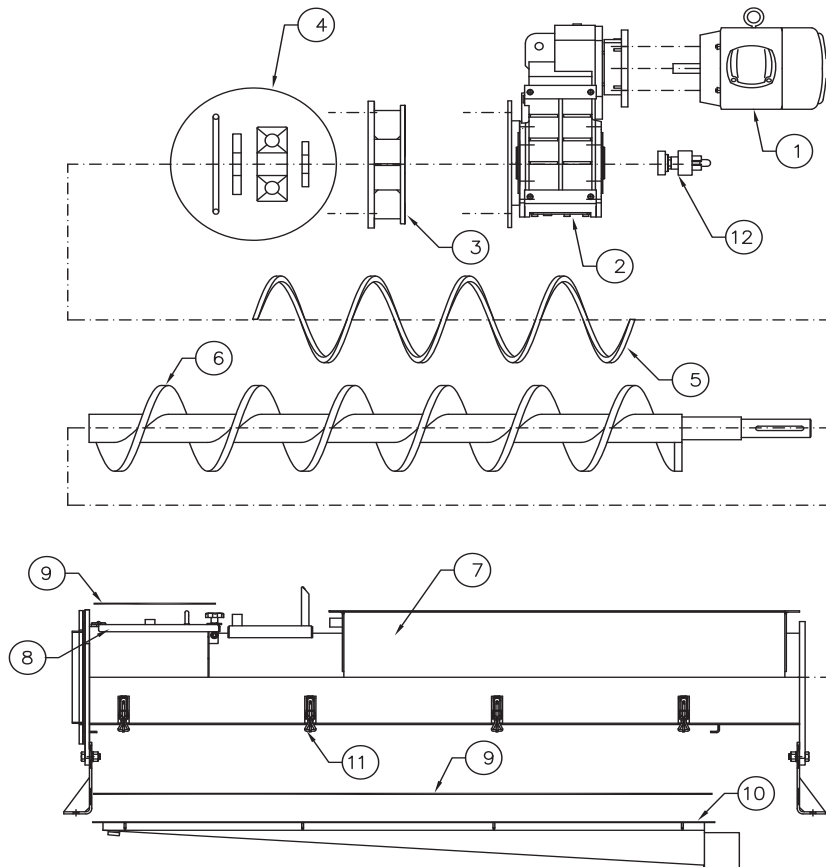
All of this information will help us expedite the correct parts for your machine.

6.1 Assembly Drawings

The following drawings reference the working components of the Wash Press and are to be used when ordering replacement parts.

A. Wash Press Assembly

PARTS DIAGRAM
WASHING COMPACTING SCREW TYPE PRESS



| ITEM # | DESCRIPTION | PART NUMBER |
|--------|------------------------|-----------------|
| 1 | MOTOR | Consult Factory |
| 2 | GEAR REDUCER | |
| 3 | THRUST BEARING HOUSING | |
| 4 | THRUST BEARING & SEALS | |
| 5 | SPIRAL BRUSH | |
| 6 | CONVEYOR SPIRAL | |
| 7 | WASH PRESS HOUSING | |
| 8 | DEWATERING COVER | |
| 9 | COVER SEAL | |
| 10 | DRAIN PAN | |
| 11 | LATCH | |
| 12 | SWIVEL JOINT | |

Vulcan Industries Inc.
212 South Kirlin St.
Missouri Valley, IA 51555
Ph. 712 642 2755
Fax 712 642 4256

When ordering parts:
Reference Factory No.
and Model No.



Section 6 Parts Lists & Vendor Data

6.2 Drive Motor and Gear Data

VULCAN INDUSTRIES, INC.

| | | |
|----------------------|-------------|---|
| Device 1 | | Quality Control Document |
| Job No. | 19177 | Form #: 4.4.11 |
| Job Name | Wichita KS. | Date of test: 1/3/2020 |
| Equipment Type | EWP 300/600 | |
| Equipment Serial No. | 19177-450-5 | |
| Tagged WC-1 | | Description of test: In Shop Factory Test |

| Motor Nameplate Data | | | | |
|----------------------|-----------------|------|----------|-------|
| Mfg. | Baldor-Reliance | | | |
| Serial No. | F1908275487 | | | |
| CAT No. | | | | |
| Spec. # | 07J475X790G1 | | | |
| No. | D61008984 | | | |
| Frame | Type | Code | Design | Class |
| 213TC | C1/D1 | J | A | F |
| Encl. | H.P. | PH. | HZ | RPM |
| | 7.5 | 3 | 60 | 1770 |
| S.F. | VOLTS | | AMPS | |
| 1.15 | 230 / 460 | | 19 / 9.5 | |
| DE brg | 6307 | | | |
| ODE brg | 6206 | | | |

| Reducer Nameplate Data | |
|------------------------|---------------------|
| Mfg. | Siemens |
| Serial No. | FDU1909/2501040 001 |
| Type | KAF129-K5-(210) |
| Mount | M4-B |
| Oil Capacity | 20.0 liter |
| T ₂ = | 3479 Nm |
| N ₂ = | |
| I (ratio) = | 114.06 |
| SF | |

| Brake Nameplate Data | |
|----------------------|--|
| Mfg. | |
| Serial No. | |
| Model No. | |
| Ft lbs torque | |
| Voltage | |

| Test Remarks | | | |
|----------------------------------|-----|-----|--|
| Reducer vent plug installed | Y | N | |
| Oil level confirmed | Y | N | |
| All lubrication completed | Y | N | |
| Adjustment required | Y | N | |
| Operated with designed controls | Y | N | |
| Video taped operation | Y | N | |
| Control panel verified | Y | N | |
| 8 hr run test completed | Y | N | |
| Screen hour meter start / finish | 0.4 | 8.4 | |

| Testing Equipment: | | |
|-----------------------|------------|---------------------|
| Test Device 1: | Serial No. | Date of Calibration |
| Fluke 333 Clamp Meter | 79610273 | 7/24/2020 |
| Test Device 2: | Serial No. | Date of Calibration |
| Fluke 65 Thermometer | 95600311 | 7/13/2020 |

| Voltage Reading Phase to Phase: | | | | |
|---------------------------------|-------|-------|------------------|--------------------|
| L1-L2 | L1-L3 | L2-L3 | Motor Temp. Rise | Reducer Temp. Rise |
| 482 | 474 | 486 | 66 | 66 |
| | | | at start up | |
| Motor Amp Reading | | | 72 | 15 min. |
| T1 | T2 | T3 | 78 | 30 min |
| 4.3 | 5.2 | 4.8 | 90 | 1 hr. |
| | | | 99 | 2 hr. |
| | | | 102 | 3 hr. |
| | | | 102 | 4 hr. |
| | | | 103 | 5 hr. |
| | | | 104 | 6 hr. |
| | | | 105 | 7 hr. |
| | | | 105 | 8 hr. |

| TEST REMARKS: |
|---|
| <p>Went over control panel operation with technician, verifying complete operation.</p> <p>Connected control panel to equipment and verified operation between the two pieces of equipment</p> <p>Ran equipment for period of 8 hours monitoring amps, voltage, and temperature of both motor and gear box.</p> |

VULCAN INDUSTRIES, INC.

| | | |
|----------------------|-------------|---|
| Device 1 | | Quality Control Document |
| Job No. | 19177 | Form #: 4.4.11 |
| Job Name | Wichita KS. | Date of test: 1/21/2020 |
| Equipment Type | EWP 300/600 | |
| Equipment Serial No. | 19177-450-6 | |
| | Tagged WC-2 | Description of test: In Shop Factory Test |

| Motor Nameplate Data | | | | |
|----------------------|-----------------|------|----------|-------|
| Mfg. | Baldor-Reliance | | | |
| Serial No. | F1908275488 | | | |
| CAT No. | | | | |
| Spec. # | 07J475X790G1 | | | |
| No. | D61008985 | | | |
| Frame | Type | Code | Design | Class |
| 213TC | C1/D1 | J | A | F |
| Encl. | H.P. | PH. | HZ | RPM |
| | 7.5 | 3 | 60 | 1770 |
| S.F. | VOLTS | | AMPS | |
| 1.15 | 230 / 460 | | 19 / 9.5 | |
| DE brg | 6307 | | | |
| ODE brg | 6206 | | | |

| Reducer Nameplate Data | |
|------------------------|---------------------|
| Mfg. | Siemens |
| Serial No. | FDU1909/2500958 001 |
| Type | KAF129-K5-(210) |
| Mount | M4-A |
| Oil Capacity | 20.0 liter |
| T ₂ = | 3479 Nm |
| N ₂ = | |
| I (ratio) = | 114.06 |
| SF | |

| Brake Nameplate Data | |
|----------------------|--|
| Mfg. | |
| Serial No. | |
| Model No. | |
| Ft lbs torque | |
| Voltage | |

| Test Remarks | | | |
|----------------------------------|-----|-----|--|
| Reducer vent plug installed | Y | N | |
| Oil level confirmed | Y | N | |
| All lubrication completed | Y | N | |
| Adjustment required | Y | N | |
| Operated with designed controls | Y | N | |
| Video taped operation | Y | N | |
| Control panel verified | Y | N | |
| 8 hr run test completed | Y | N | |
| Screen hour meter start / finish | 0.3 | 8.4 | |

| Testing Equipment: | | |
|-----------------------|------------|---------------------|
| Test Device 1: | Serial No. | Date of Calibration |
| Fluke 333 Clamp Meter | 79610273 | 7/24/2020 |
| Test Device 2: | Serial No. | Date of Calibration |
| Fluke 65 Thermometer | 95600311 | 7/13/2020 |

| Voltage Reading Phase to Phase: | | | | |
|---------------------------------|-------|-------|------------------|--------------------|
| L1-L2 | L1-L3 | L2-L3 | Motor Temp. Rise | Reducer Temp. Rise |
| 478 | 487 | 489 | 66 | at start up 65 |
| Motor Amp Reading | | | 76 | 15 min. 73 |
| T1 | T2 | T3 | 80 | 30 min 79 |
| 4.4 | 4.8 | 5.3 | 87 | 1 hr. 86 |
| | | | 98 | 2 hr. 92 |
| | | | 101 | 3 hr. 98 |
| | | | 102 | 4 hr. 102 |
| | | | 102 | 5 hr. 104 |
| | | | 105 | 6 hr. 108 |
| | | | 105 | 7 hr. 108 |
| | | | 105 | 8 hr. 108 |

| TEST REMARKS: |
|---|
| <p>Went over control panel operation with technician, verifying complete operation.</p> <p>Connected control panel to equipment and verified operation between the two pieces of equipment</p> <p>Ran equipment for period of 8 hours monitoring amps, voltage, and temperature of both motor and gear box.</p> |

BALDOR® • RELIANCE

Product Information Packet

DXP INDUSTRIES

07J475X790G1

7.5HP, 1770RPM, 3PH, 60HZ, 213TC, 0735M, XPFC

| Part Detail | | | | | | | | | |
|----------------------|--------------|--------------|------------|----------------|----------|---------------|------------|--|--|
| Revision: | - | Status: | PRD/A | Change #: | | Proprietary: | No | | |
| Type: | AC | Prod. Type: | 0735M | Elec. Spec: | 07WGX790 | CD Diagram: | | | |
| Enclosure: | XPFC | Mfg Plant: | | Mech. Spec: | 07J475 | Layout: | | | |
| Frame: | 213TC | Mounting: | F1 | Poles: | 04 | Created Date: | 08-13-2013 | | |
| Base: | RG | Rotation: | R | Insulation: | F | Eff. Date: | 08-15-2013 | | |
| Leads: | 9#14 | Literature: | | Elec. Diagram: | | Replaced By: | | | |
| Nameplate NP0977XPSL | | | | | | | | | |
| NO. | | CC | 010A | | | | | | |
| SER. | | TEMP CODE | T3C | | | | | | |
| SPEC. | 07J475X790G1 | | | | | | | | |
| CAT.NO. | | | | | | | | | |
| HP | 7.5 | | | | | | | | |
| VOLTS | 230/460 | | | | | | | | |
| AMPS | 19/9.5 | | | | | | | | |
| RPM | 1770 | MOTOR WEIGHT | 230 LBS | | | | | | |
| HERTZ | 60 | PH | 3 | CL | F | DE BRG | 6307 | | |
| SER.F. | 1.15 | DES | A | CODE | J | ODE BRG | 6206 | | |
| FRAME | 213TC | GREASE | POLYREX EM | | | | | | |
| RATING | 50C AMB-CONT | | | | | | | | |
| USABLE AT 208V | | NEMA-NOM-EFF | 91.7 | PF | 81 | | | | |
| | | | | | | | | | |

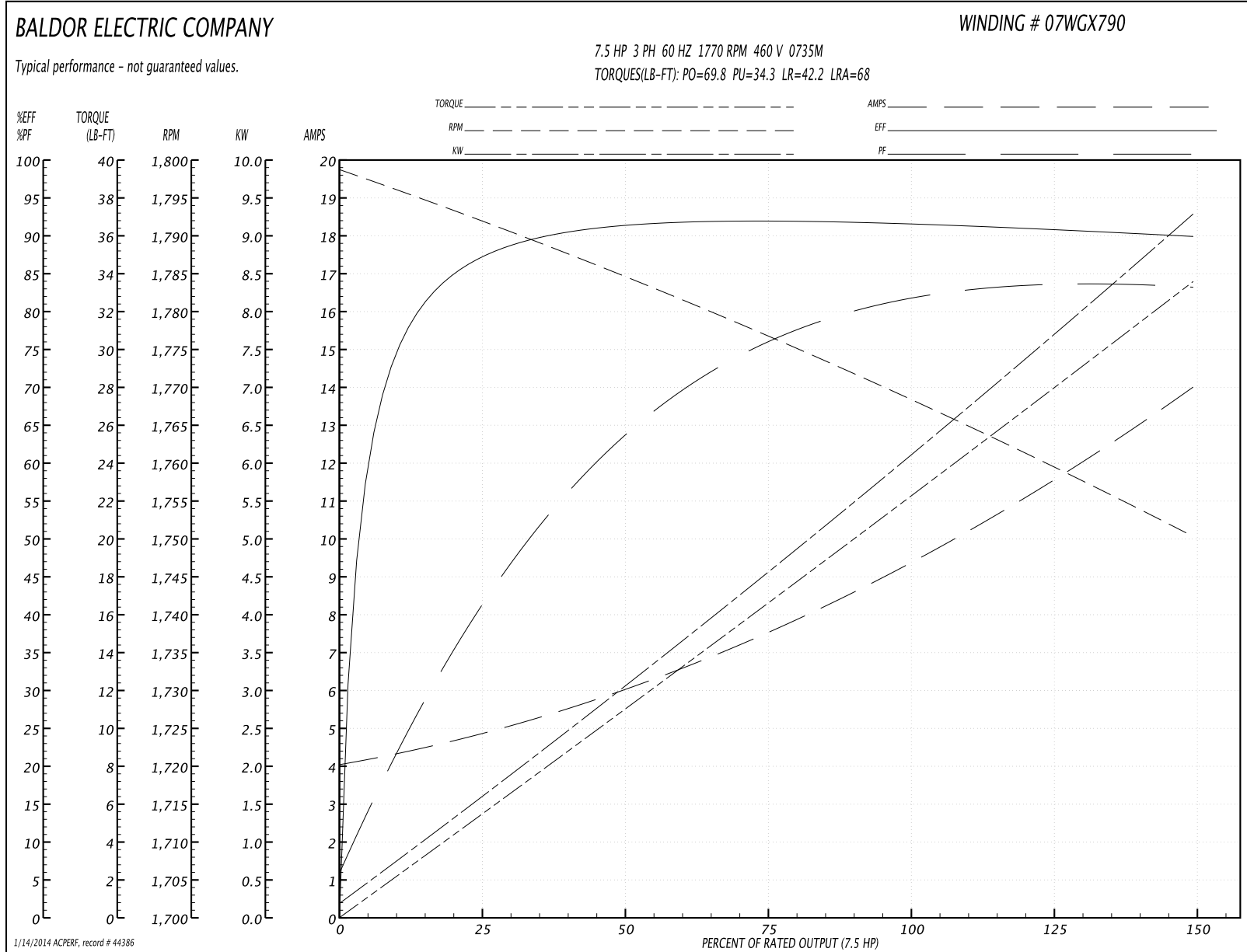
| Parts List | | |
|-------------|---|----------|
| Part Number | Description | Quantity |
| SA267518 | SA 07J475X790G1 | 1.000 EA |
| RA254190 | RA 07J475X790G1 | 1.000 EA |
| 37FN3002C01 | EXFN, PLASTIC, 6.00 OD, 1.155 ID | 1.000 EA |
| HA3210E08 | .250X 7/8 PIN 312-57 | 1.000 EA |
| HW3201A05 | 3/8-16 EYEBOLT | 1.000 EA |
| 07CB1000A01 | CONDUIT BOX MACH | 1.000 EA |
| 10XN3118A16 | 5/16-18X1 HEX HD CAP | 4.000 EA |
| HW1001A31 | LOCKWASHER 5/16, ZINC PLT.591 OD, .319 I | 4.000 EA |
| 11XW1032G06 | 10-32 X .38, TAPTITE II, HEX WSHR SLTD U | 1.000 EA |
| WD1000B17 | T&B CX35TN TERMINAL | 1.000 EA |
| 07EP1707A11 | FRONT ENDPLATE EXPLOSION PROOF-W/DRAINS | 1.000 EA |
| HW4500A19 | 1/4-28X1/4 SLOTTED PLUG F/S | 2.000 EA |
| HW4506A02 | BREATHING/DRAIN-EXP PROOF-.125-27 NPTF AI | 1.000 EA |
| HW3022E05 | .125 DIA X .500 ROLLED SPRING PIN | 1.000 EA |
| 10XN3816K28 | 3/8-16 X 1.75 HEX HD CAP SCREW, GRADE 5 | 4.000 EA |
| HW1001A38 | LOCKWASHER 3/8, ZINC PLT .688 OD, .382 I | 4.000 EA |
| HW5100A06 | W2420-025 WVY WSHR (WB) | 1.000 EA |
| 07EP1708A01 | STANDARD FACE MOUNTED ENDPLATE EXPLOSEIO | 1.000 EA |
| HW4500A19 | 1/4-28X1/4 SLOTTED PLUG F/S | 2.000 EA |
| 10XN3816K28 | 3/8-16 X 1.75 HEX HD CAP SCREW, GRADE 5 | 4.000 EA |
| HW1001A38 | LOCKWASHER 3/8, ZINC PLT .688 OD, .382 I | 4.000 EA |
| 10XN2520A32 | 1/4 X 2 HEX HEAD CAP SCR, GRADE 2 | 4.000 EA |
| HW1001A25 | LOCKWASHER 1/4, ZINC PLT .493 OD, .255 I | 4.000 EA |
| 07FH1003A09 | 307 EXPLOSION PROOF FAN HOUSING FOR DRIP | 1.000 EA |

| Parts List (continued) | | |
|------------------------|--|----------|
| Part Number | Description | Quantity |
| 10XN2520A12 | O1/4-20X 3/4 HEX HEAD CAP | 4.000 EA |
| 37FH4500A04 | DRIPCOVER, STAMPED | 1.000 EA |
| 12XN1032A16 | 10-32X1 HEX HD SLTD X | 4.000 EA |
| HA2001A05 | SPACER, .218 ID X .500 LG | 4.000 EA |
| 07CB1502A01 | CONDUIT BOX LID MACH (DUCTILE IRON) | 1.000 EA |
| 84XN2520J16 | 1/4-20 X 1 SOC HD CAP SCREW | 4.000 EA |
| HW1001A25 | LOCKWASHER 1/4, ZINC PLT .493 OD, .255 I | 4.000 EA |
| HW2501F21 | KEY, 5/16 SQ X 2.375 | 1.000 EA |
| HA7000A02 | KEY RETAINER RING, 1 1/8 DIA, 1 3/8 DIA | 1.000 EA |
| 85XU0407S04 | 4X1/4 U DRIVE PIN STAINLESS | 6.000 EA |
| LB1081 | ALUM XP CAUTION LABEL | 1.000 EA |
| LB1115 | LABEL,LIFTING DEVICE | 1.000 EA |
| MJ1000A75 | GREASE, POLYREX EM EXXON | 0.050 LB |
| 51XB1214A16 | 12-14X1.00 HXWSSLD SERTYB | 1.000 EA |
| MG1025Z20 | ACTIVATOR WILKOFAS 060.32 | 0.010 GA |
| MG1025G29 | DARK CHARCOAL METALLIC GREY 789.205 | 0.036 GA |
| LB1119 | WARNING LABEL | 1.000 EA |
| LB1172A01 | CUSTOM MTR CARTON LABEL LASER PRINTER | 1.000 EA |
| LC0145B01 | CONNECTION LABEL | 1.000 EA |
| LB1506 | LABEL "AMERICAN MADE" 1.50 X 1.00 | 1.000 EA |
| NP0977XPSL | SS XP UL CSA CC CL-I GP-C&D | 1.000 EA |
| 07PA1011 | PKG GRP, 07 CAST IRON PK1181 | 1.000 EA |

Performance Data at 460V, 60Hz, 7.5HP (Typical performance - Not guaranteed values)

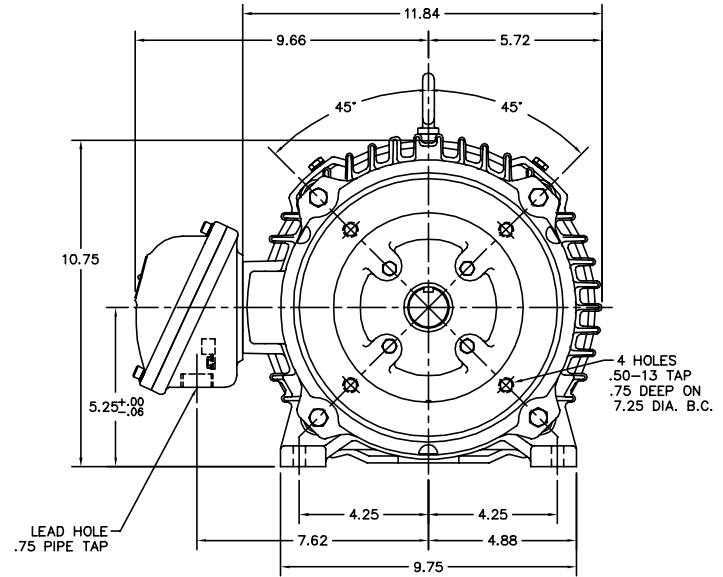
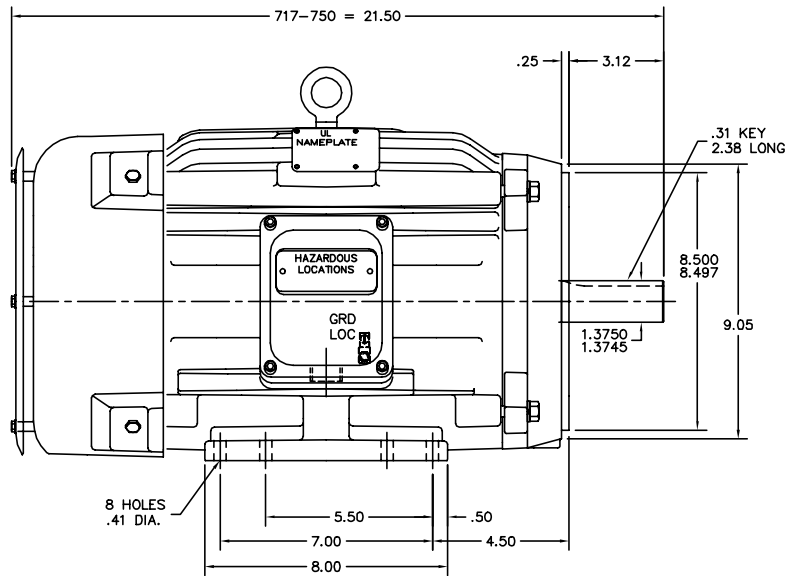
| General Characteristics | | | | | | | |
|--------------------------|--------------------------------|--------|--------|----------------------|------------|--------|--------|
| Full Load Torque: | 22.2 LB-FT | | | Start Configuration: | DOL | | |
| No-Load Current: | 4.18 Amps | | | Break-Down Torque: | 69.8 LB-FT | | |
| Line-line Res. @ 25°C.: | 1.43 Ohms A Ph / 0.0 Ohms B Ph | | | Pull-Up Torque: | 34.3 LB-FT | | |
| Temp. Rise @ Rated Load: | 42 C | | | Locked-Rotor Torque: | 42.2 LB-FT | | |
| Temp. Rise @ S.F. Load: | 52 C | | | Starting Current: | 68.0 Amps | | |
| Load Characteristics | | | | | | | |
| % of Rated Load | 25 | 50 | 75 | 100 | 125 | 150 | S.F. |
| Power Factor: | 43.0 | 65.0 | 76.0 | 81.0 | 83.0 | 84.0 | 82.0 |
| Efficiency: | 86.6 | 91.1 | 91.9 | 91.9 | 90.9 | 89.9 | 91.3 |
| Speed: | 1792.0 | 1784.0 | 1777.0 | 1769.0 | 1760.0 | 1750.0 | 1764.0 |
| Line Amperes: | 4.68 | 5.93 | 7.53 | 9.44 | 11.6 | 13.9 | 10.7 |

Performance Graph at 460V, 60Hz, 7.5HP Typical performance - Not guaranteed values



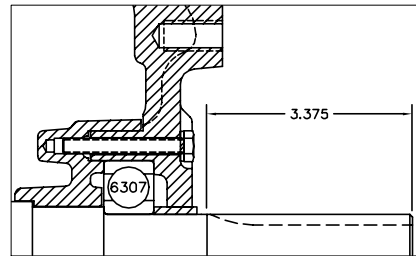
1/14/2014 ACPERF, record # 44386

07LYJ475



8 HOLES
.41 DIA.

FRONT ENDPLATE DRAIN ASSEMBLY



PULLEY END DETAIL

CUSTOMER IS RESPONSIBLE FOR DETERMINING THAT MOTOR PERFORMANCE IS SUITABLE IN THE APPLICATION.

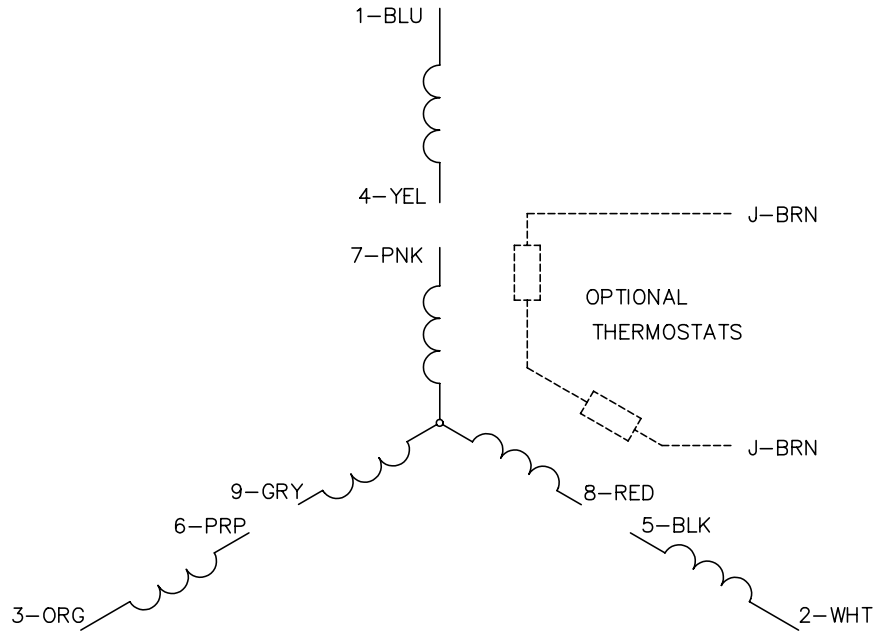
| | | | |
|---|--------|------------------------------|-------------|
| REV. DESC: CHG HW4501A02 TO HW4506A02 & HW3022E05 | | | |
| REV. LTR: A | BY: JF | REVISED: 06:39:31 10/31/2003 | TDR: 315895 |
| FILE: AAA00086400 | | REF: 07LYJ475 | |
| MTL: - | | | |

BALDOR ELECTRIC Co.

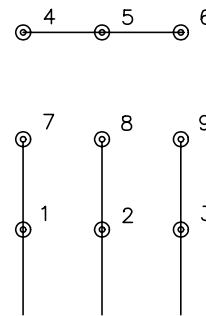
HORZ 213-5TC XPFC CL-I GP-C&D W/ DRIP COVER (DRILL RIG MOTOR)

07LYJ475

CD0005

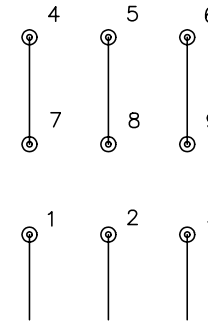


LOW VOLTAGE
(2Y)



LINE

HIGH VOLTAGE
(1Y)



LINE

NOTES:

1. INTERCHANGE ANY TWO LINE LEADS TO REVERSE ROTATION.
2. OPTIONAL THERMOSTATS ARE PROVIDED WHEN SPECIFIED.
3. ACTUAL NUMBER OF INTERNAL PARALLEL CIRCUITS MAY BE A MULTIPLE OF THOSE SHOWN ABOVE.
4. LEAD COLORS ARE OPTIONAL. LEADS MUST ALWAYS BE NUMBERED AS SHOWN.

| | | | |
|---|---------|-------------------------|--------------|
| REV. DESC: REVISE TO SHOW OPTIONAL COLORS | | | |
| REV. LTR: E | BY: JLP | REVISED: 01/19/99 10:15 | TDR: 0171435 |
| 90000 | | FILE: AAA00005140 | MDL: - |
| | | MTL: - | |

BALDOR ELECTRIC Co.

3PH, DV, 9 LEADS

CD0005



AC Induction Motor Performance Data

Record # 44386

Typical performance - not guaranteed values

| | | |
|--------------------------|--------------------|------------------------|
| Winding: 07WGX790 | Type: 0735M | Enclosure: XPFC |
|--------------------------|--------------------|------------------------|

| Nameplate Data | | | | General Characteristics at 460 V, 60 Hz: Single Volt Motor | |
|-------------------|--------------|----------|----|---|------------|
| Rated Output (HP) | 7.5 | | | Full Load Torque | 22.2 LB-FT |
| Volts | 230/460 | | | Start Configuration | DOL |
| Full Load Amps | 19/9.5 | | | Break Down Torque | 69.8 LB-FT |
| R.P.M. | 1770 | | | Pull-Up Torque | 34.3 LB-FT |
| Hz | 60 | Phase | 3 | Locked-rotor Torque | 42.2 LB-FT |
| NEMA Design Code | A | KVA Code | J | Starting Current | 68 Amps |
| Service Factor | 1.15 | | | No-load Current | 4.18 Amps |
| NEMA Nom. Eff. | 91.7 | P.F. | 81 | Line-line Res. @ 25°C. | 1.43 Ohms |
| Rating - Duty | 50C AMB-CONT | | | Temp. Rise @ Rated Load | 42°C |
| S.F. Amps | | | | Temp. Rise @ S.F. Load | 52°C |

Load Characteristics at 460 Volts, 60 Hz

| % of Rated Load | 25 | 50 | 75 | 100 | 125 | 150 | S.F. |
|-----------------|------|------|------|------|------|------|------|
| Power Factor | 43 | 65 | 76 | 81 | 83 | 84 | 82 |
| Efficiency | 86.6 | 91.1 | 91.9 | 91.9 | 90.9 | 89.9 | 91.3 |
| Speed | 1792 | 1784 | 1777 | 1769 | 1760 | 1750 | 1764 |
| Line Amperes | 4.68 | 5.93 | 7.53 | 9.44 | 11.6 | 13.9 | 10.7 |

Baldor Electric Company Fort Smith, Arkansas





0.19.60

Datasheet for SIMOGEAR Geared Motors

MLFB-Ordering

data:

2KJ3512-5DA05-0FB2-Z

D14+H09+K06+K41+L03+L50+Y00

{Y00:*AND@1770*|*ANL@5.59*}

Client order no.:

Order no.:

Offer no.:

Item no.:

Consignment no.:

Project:

Geared motor basic data

| | |
|----------------------------------|----------------------------------|
| Type designation: | SIMOGEAR KAF129-K5-(210) |
| Gearbox type: | Bevel gearbox |
| Installation size(s): | 129 |
| Application: | Standard |
| Light-duty sector acc. VDI 3643: | - |
| Transmission ratio: | 114.06 |
| Relation of number of teeth: | 56462 // 495 |
| Service factor: | - |
| Nominal torque: | 4400 Nm |
| Output torque: | - |
| Output speed: | - |
| Environment temperature: | -15 ... +40°C |
| Specification: | CE (Europe / other countries) |
| Oil quantity: | 20.00 l |
| Weight without oil: | 199.4 kg |
| Adapter: | K5 Short adapter for NEMA motors |
| Permissible input torque: | 95 Nm |

Adapter options

| | |
|------------------------------------|---|
| Backstop: | - |
| Condensation drain hole: | - |
| Input Shaft w/o Feather Key: | - |
| Rotation output shaft: | - |
| Slip clutch with proximity switch: | - |
| Slip torque is set: | - |
| Rotating direction: | - |

General options

| | |
|------------------------------------|---|
| Surface treatments: | Painted |
| Coating: | [L03] Coating for low environmental stress C2 |
| RAL Color: | [L50] 5015 sky blue |
| Pretreatment: | - |
| Coating on Flange: | - |
| Conservation: | - |
| Rating Plate stainless steel: | - |
| Second rating plate: | [K41] second rating plate supplied loose |
| Packaging: | Standard packing |
| Fast lane: | - |
| Enclosed documentation: | - |
| Additional documentation (E-Mail): | - |

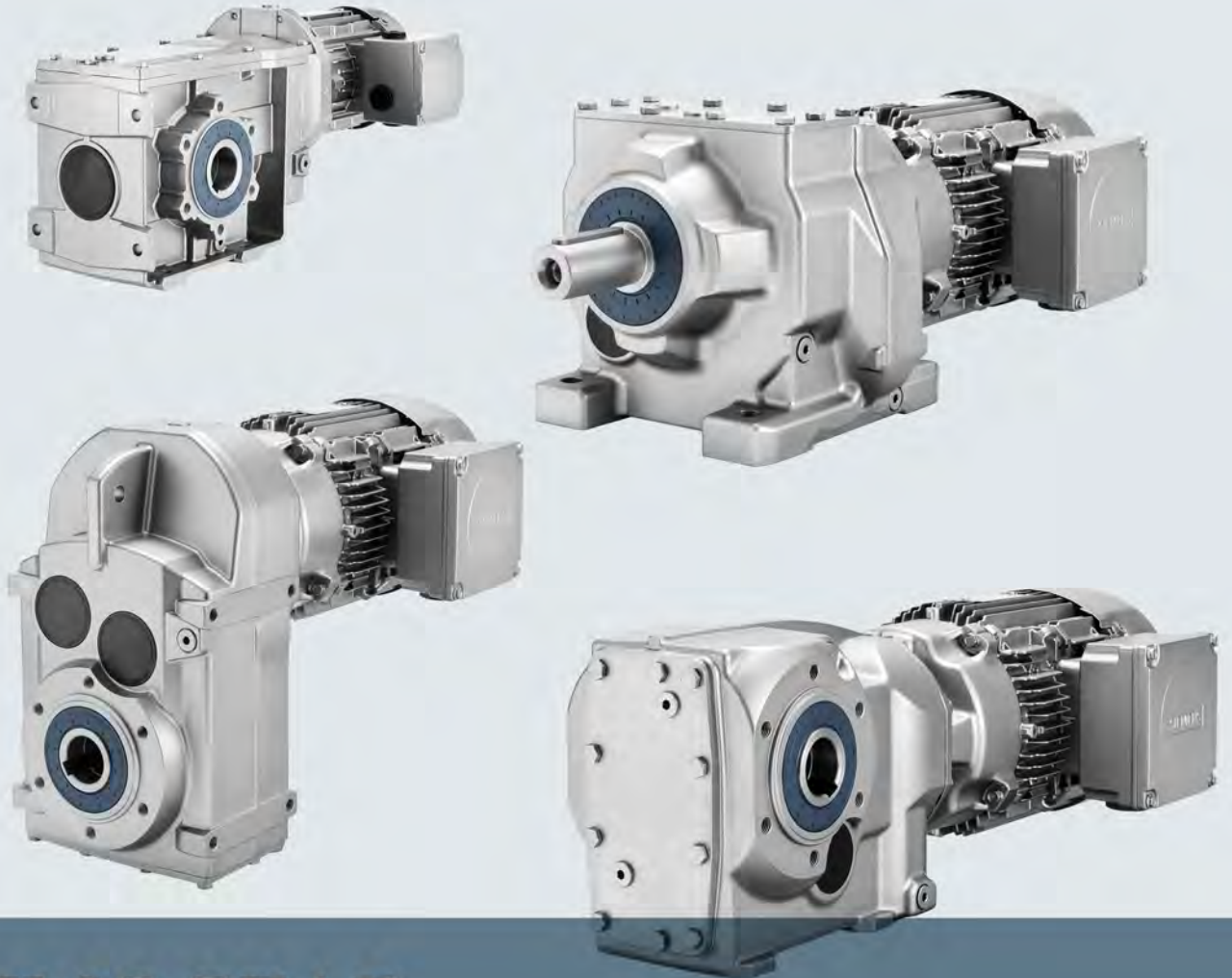
Gearbox options

| | |
|--|-----------------------------|
| Mounting position: | [D14] M4 output side A |
| Special installation (Angle): | - |
| Permissible mount. position deviation: | - |
| Mount. pos. deviation (Angle): | - |
| Mounting type: | Flange-mounted design |
| Position of torque arm: | - |
| Flange diameter: | 450 |
| Output flange tightened: | - |
| Output shaft: | H70 |
| Output shaft bearing: | Standard bearing |
| Hollow shaft cover: | Sealing cap |
| Gear oil: | [K06] Mineral oil CLP VG220 |
| Output shaft sealing: | Standard sealing |
| Gearbox breather: | Pressure breather valve |
| Oil level control: | Oil level screw |
| Electr. oil temperature monitoring: | - |
| Disconnecter unit, 24 V param.: | - |
| Adapter cable USB/jacks: | - |
| Oil level gauge: | - |
| Separation switch gear: | - |

| | |
|-----------------------------------|----------------|
| Oil drain: | Oil drain plug |
| Housing material: | Cast iron |
| Backlash Design: | - |
| Relubrication: | - |
| Drywell: | - |
| 24 V Drywell switch disconnecter: | - |
| Flange-Figure: | - |

| Performance data motor | |
|------------------------|----------|
| Input speed (Info): | 1770 rpm |
| Motor power (Info): | 5.59 kW |

SIEMENS



SIMOGEAR

Gearbox

BA 2030

Operating instructions

Edition

04/2016

Answers for industry.

4.5 Gearbox with flange fastening

Note

Siemens AG recommends an anaerobic adhesive to enhance the friction lock between flange and mounting surface.

Table 4- 3 Thread size of the fastening bolt

| Thread size | Flange | Helical gearbox D/Z | Parallel shaft gearbox F | Bevel gearbox B, K | Helical worm gearbox C |
|-------------|------------|------------------------|-----------------------------|-----------------------|---------------------------|
| | | Size | | | |
| M6 | A120 | 19, 29, 39 | 29 | B29 | 29 |
| M8 | A140, A160 | 19, 29, 39, 49, 59 | 29, 39 | B29, B39, K39 | 39 |
| M10 | A200 | 39, 49, 59, 69 | 49 | B39, B49, K49 | 49, 69 |
| M12 | A250, A300 | 59, 69, 79, 89 | 69, 79, 89 | K69, K79, K89 | 89 |
| M16 | A350 | 89, 109, 129 | 109 | K109 | - |
| M16 | A450 | 109, 129, 149, 169 | 129, 149 | K129, K149 | - |
| M16 | A550 | 169, 189 | 169 | K169 | - |
| M20 | A660 | 189 | 189 | K189 | - |

Use screws / nuts of strength class 8.8 for gearboxes with a flange-mounted design.

Note the following exceptions:

Table 4- 4 Strength class of the fastening bolt for FF/FAF and KF/KAF

| Gearbox size | Flange | Strength class for motor size | | | | | | | | | | |
|-----------------|--------|-------------------------------|------|------|------|------|------|------|------|------|------|------|
| | | 90 | 100 | 112 | 132 | 160 | 180 | 200 | 225 | 250 | 280 | 315 |
| 39 | A160 | 10.9 | 10.9 | - | - | - | - | - | - | - | - | - |
| 49 | A200 | 8.8 | 10.9 | 10.9 | 10.9 | - | - | - | - | - | - | - |
| 69 | A250 | 8.8 | 8.8 | 8.8 | 10.9 | - | - | - | - | - | - | - |
| 79 | A250 | 8.8 | 8.8 | 8.8 | 10.9 | 10.9 | - | - | - | - | - | - |
| 89 | A300 | 8.8 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | - | - | - | - | - |
| 109 | A350 | 8.8 | 8.8 | 8.8 | 8.8 | 10.9 | 10.9 | 10.9 | 10.9 | - | - | - |
| 129 | A450 | 8.8 | 8.8 | 8.8 | 8.8 | 8.8 | 8.8 | 8.8 | 8.8 | - | - | - |
| 149 | A450 | - | 8.8 | 8.8 | 8.8 | 8.8 | 8.8 | 10.9 | 10.9 | 10.9 | - | - |
| 169 | A550 | - | - | 8.8 | 8.8 | 8.8 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | - |
| 189 | A660 | - | - | 8.8 | 8.8 | 8.8 | 8.8 | 8.8 | 8.8 | 10.9 | 10.9 | 10.9 |

4.9 Installing and removing the shaft-mounted gearbox

4.9.1 General information on installing the shaft-mounted gearbox

| |
|---|
| NOTICE |
| Damage to shaft sealing rings caused by solvent Avoid any contact of solvent or benzine with the shaft sealing rings. |

| |
|--|
| NOTICE |
| Subjecting stress to the hollow shaft causes bearing failure Skewing or stressing the hollow shaft increases the loading. This can cause bearing failure. The hollow shaft must be flush with the machine shaft to avoid misalignment. Do not subject the hollow shaft to axial and radial stress. |

| |
|--|
| NOTICE |
| For shrink disks: Lubricants in the area between the hollow shaft and machine shaft impair torque transmission Keep the bore in the hollow shaft and the machine shaft completely grease-free. Do not use impure solvents and soiled cleaning cloths. |

Note

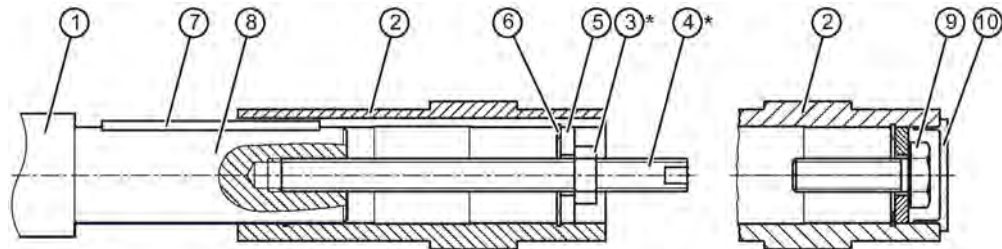
Coat the contact surfaces with the mounting paste supplied with the product or any suitable lubricant to prevent frictional corrosion.

Note

Observe the permissible concentricity tolerance of the cylindrical shaft extension of the machine shaft to the housing axle according to DIN 42955.

4.9.2 Hollow shaft with parallel key

4.9.2.1 Mounting the hollow shaft with parallel key



* Not included in scope of supply

- | | |
|--------------------|------------------|
| ① Machine shaft | ⑥ Circlip |
| ② Hollow shaft | ⑦ Parallel key |
| ③ Hexagon nut | ⑧ Mounting paste |
| ④ Threaded spindle | ⑨ Bolt |
| ⑤ Disk | ⑩ Sealing caps |

Image 4-4 Mounting the hollow shaft with parallel key

Instead of the nut and threaded spindle shown in the diagram, other types of equipment such as hydraulic lifting equipment may be used.

Procedure

1. Using benzine or a solvent, remove the anti-corrosion protection from the shaft ends and flanges.
2. Check the seats or edges of the hollow and machine shafts for damage. Contact Technical Support if you notice any damage.
3. Apply the mounting paste provided ① to the machine shaft ⑧. Apply the paste uniformly.
4. Fit the gearbox using the disk ⑤, threaded spindle ④ and nut ③. Support is provided by the hollow shaft ②.
5. Replace the nut ③ and the threaded spindle ④ with a screw ⑨. Tighten the bolts ⑨ to the specified torque.
6. Close the open hollow shaft end using a sealing cap ⑩.

You have mounted the hollow shaft with feather key.

Table 4- 6 Tightening torque for the screw

| Thread size | M5 | M6 | M8 | M10 | M12 | M16 | M20 | M24 | M30 |
|------------------------|----|----|----|-----|-----|-----|-----|-----|-----|
| Tightening torque [Nm] | 5 | 8 | 8 | 14 | 24 | 60 | 120 | 200 | 400 |

4.9.2.2 Removing the hollow shaft with parallel key

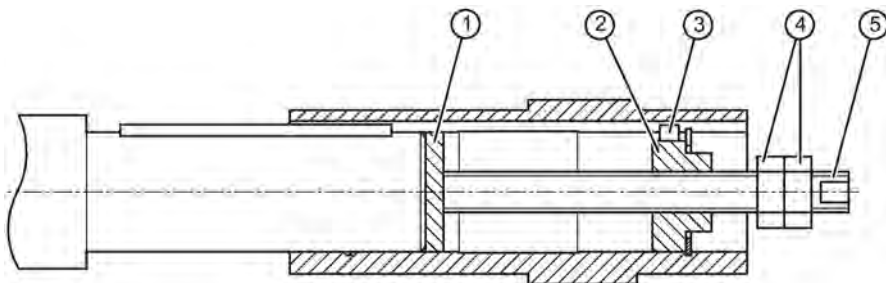
⚠ WARNING
Inadequately secured gearbox or geared motors can free themselves
Before driving out the machine shaft, fasten a suitably dimensioned means of absorbing load to the gearbox.
Slightly pretension the pulling equipment so that the gearbox does not drop onto it when the insert shaft is released.

NOTICE
Subjecting stress to the hollow shaft causes bearing failure
It is essential to prevent misalignment when removing the unit.

NOTICE
Excessive forces during removal
Excessive forces can occur during removal of the hollow shaft via the housing.
Stresses in the hollow shaft can lead to bearing failure and damage to the gearbox housing.

Note

If frictional corrosion has occurred on the seat surfaces, use rust solvent to facilitate the removal of the gearbox. Allow an adequately long time for the rust solvent to take effect.



- Items ① to ⑤ are not included in the scope of supply.
- | | |
|------------------|---------------|
| ① Disk | ④ Hexagon nut |
| ② Threaded block | ⑤ Leadscrew |
| ③ Parallel key | |

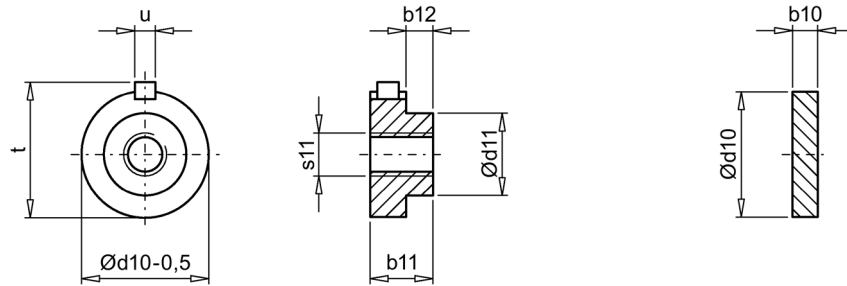
Image 4-5 Removing the hollow shaft with parallel key

Procedure

1. Remove the axial locking element from the hollow shaft.
2. Drive out the machine shaft using the disk ①, threaded block ②, feather key ③, threaded spindle ⑤ and hexagon nuts ④.

You have now removed the hollow shaft with parallel key.

Design suggestion for threaded block and disk



| Gearbox | Size | Hollow shaft \varnothing | b10 | b11 | b12 | d10 | d11 | s11 | t _{max} | u |
|------------|------|----------------------------|------|------|------|-------|------|------|------------------|------|
| | | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] |
| B | 19 | 20 | 3 | 15 | 10 | 19.9 | 10 | M6 | 22.5 | 6 |
| B, C | 29 | 20 | 3 | 15 | 10 | 19.9 | 10 | M6 | 22.5 | 6 |
| B, F | 29 | 25 | 3 | 15 | 10 | 24.9 | 16 | M10 | 28 | 8 |
| C | 39 | 25 | 3 | 15 | 10 | 24.9 | 16 | M10 | 28 | 8 |
| B, K, F, C | | 30 | 6 | 15 | 10 | 29.9 | 18 | M10 | 33 | 8 |
| B | | 35 | 6 | 15 | 10 | 34.9 | 24 | M12 | 38 | 10 |
| B | | 40 | 6 | 15 | 10 | 39.9 | 28 | M16 | 43 | 12 |
| C | 49 | 30 | 6 | 15 | 10 | 29.9 | 18 | M10 | 33 | 8 |
| K, F, C | | 35 | 6 | 15 | 10 | 34.9 | 24 | M12 | 38 | 10 |
| B | | 40 | 6 | 15 | 10 | 39.9 | 28 | M16 | 43 | 12 |
| K, F, C | 69 | 40 | 6 | 20 | 9 | 39.9 | 28 | M16 | 43 | 12 |
| C | | 45 | 6 | 20 | 9 | 44.9 | 36 | M16 | 48 | 14 |
| K, F | 79 | 40 | 6 | 20 | 9 | 39.9 | 28 | M16 | 43 | 12 |
| K, F, C | 89 | 50 | 7 | 20 | 10 | 49.9 | 36 | M16 | 53.5 | 14 |
| C | | 60 | 7 | 20 | 10 | 59.9 | 45 | M20 | 64 | 18 |
| K, F | 109 | 60 | 10 | 24 | 14 | 59.9 | 45 | M20 | 64 | 18 |
| K, F | 129 | 70 | 10 | 24 | 14 | 69.9 | 54 | M20 | 74.5 | 20 |
| K, F | 149 | 90 | 10 | 24 | 14 | 89.9 | 72 | M20 | 95 | 25 |
| K, F | 169 | 100 | 10 | 30 | 15 | 99.9 | 80 | M24 | 106 | 28 |
| K, F | 189 | 120 | 10 | 30 | 15 | 109.9 | 80 | M24 | 127 | 32 |

8.2 Checking and changing lubricants

8.2.1 General safety notes

 **WARNING**

Danger of scalding from the hot oil emerging from the unit

Before starting any work wait until the oil has cooled down to below +30 °C.

 **WARNING**

Risk of slipping on oil

Remove any oil spillage immediately with an oil-binding agent in compliance with environmental requirements.

NOTICE

Damage to the gearbox caused by incorrect oil quantities

The oil quantity and the position of the sealing elements are determined by the mounting position.

After removing the oil level screw, the oil level may not be below the specified fill level.

NOTICE

Damage to the gearbox due to open oil holes

Dirt and damaging atmosphere can penetrate through open oil holes.

Close the gearbox immediately after checking the oil level or changing the oil.

Note

Information about oil

Refer to the rating plate for the type of oil, oil viscosity and quantity of oil required.

For oil compatibility, see Recommended lubricants (Page 74).

Note

Gearbox sizes 19 and 29

Gearbox sizes 19 and 29 are lubricated for life. There is no opening to check the oil level. An oil change is not required.

In mounting positions M2 and M4 the gearboxes are equipped with a breather valve.

C29 has a breather valve in all mounting positions.

Note

Tandem gearbox - intermediate helical gearbox

- In a horizontal operating position the bulging part of the housing of the intermediate helical gearbox generally faces vertically downwards.
- The oil quantity is specified for every individual gearbox and is valid for the standard mounting position.
- Perform the following work for each individual gearbox:
 - Check the oil level.
On the main gearboxes D/Z, F, K it is not possible to check the oil level in mounting position M4. The oil level is above the oil level bore so that the bearings above it are lubricated.
 - Check the oil quality.
 - Change the oil.
 - Fill in oil and top it up.

Note

Gearbox in special mounting position

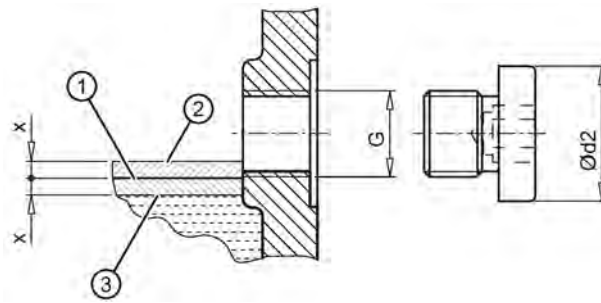
The gearbox is intended for a specific rotation angle and is delivered with the correct quantity of oil for this purpose.

It is not possible to check the oil level. You will find information regarding oil quantity and type of oil on the rating plate.

When draining the oil a higher residual quantity of oil may remain in the gearbox. When you carry out an oil change remove any residual oil.

8.2.2 Checking the oil level

| |
|---|
| NOTICE |
| The volume of gearbox oil changes with temperature If the temperature rises, the volume increases. Where temperature differences and filling quantities are significant, the volume difference can amount to several liters. The oil level must therefore be checked while still slightly warm, approximately 30 minutes after switching off the drive unit. |



- ① Specified oil level
- ② Maximum oil level
- ③ Minimum oil level

Image 8-1 Oil level in the gearbox housing

Table 8- 2 Minimum and maximum fill levels x

| Oil level hole | Ød2 | Fill level x | Tightening torque |
|----------------|------|--------------|-------------------|
| | [mm] | | |
| G 1/8" | 14 | 2.5 | 10 |
| G 1/4" | 18 | 3 | 10 |
| G 3/8" | 22 | 4 | 25 |
| G 3/4" | 32 | 7 | 50 |

Procedure

1. Switch off the power supply to the drive unit.
 2. Unscrew the oil level screw, see Mounting positions (Page 87). Oil escapes if the maximum fill level is above the plug hole.
 3. Check the oil level. Observe the fill level x.
 4. Top up the oil level if necessary and check it again.
 5. Check the state of the sealing ring on the sealing element. If the sealing ring is damaged, replace the sealing element with a new one.
 6. After checking, seal the gearbox immediately using the sealing element.
- You have now checked the oil level in the gearbox housing.

8.2.3 Checking the oil level using the oil sight glass (optional)

If there is an oil sight glass to check the oil level ①, the oil must be visible in the center of the sight glass when the oil is cool. When the oil is hot, the oil level ① is above the center of the sight glass. The oil level ① of cold oil is below the center of the sight glass.

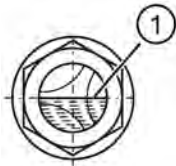


Image 8-2 Oil level in the oil sight glass

Top up the oil level ① if necessary, and check it again.

8.2.4 Checking the oil quality

Visible signs show effects on the oil. Fresh oil is clear to the eye, and has a typical smell and a specific product color. Clouding or a flocculent appearance indicates water and / or contamination. A dark or black color indicates residue, serious thermal decomposition or contamination.

Observe the symbols in the diagrams of the Mounting positions (Page 87):



Venting



Oil level

Procedure

1. Allow the geared motor to run for a short time. Wear and contaminant particles are visible in the oil shortly after shutting down.
2. Switch off the power supply to the drive unit.
3. Unscrew the sealing element at one of the points marked with the symbols listed above.
4. Remove some oil, using a suction pump and a flexible hose, for example.
5. Check the state of the sealing ring on the sealing element. When required, replace the sealing ring.
6. Seal the gearbox with the sealing element.
7. Check the oil for abnormalities. Change the oil immediately if you determine any abnormalities, see Changing the oil (Page 67).

You have now checked the oil quality.

8.2.5 Changing the oil

8.2.5.1 General safety notes for changing the oil

NOTICE**Impermissible mixing of oils leads to damage**

Impermissible mixing of oils leads to:

- Darkening
- Sediment
- Foam formation
- Change of the viscosity or reduced corrosion protection
- Wear protection.

When changing oil of the same type, the residual volume of oil in the gearbox should be kept as low as possible. Generally speaking, a small residual volume will cause no particular problems.

Gear oils of different types and by different manufacturers must not be mixed. Have the manufacturer confirm that the new oil is compatible with the remaining volume of used oil.

If very different types of oil or oils with very different additives are changed, always flush out the gearbox with the new oil. When changing from mineral oil to polyglycol oil (PG) or vice versa, it is vital to flush the gearbox twice. All traces of old oil must be completely removed from the gearbox.

NOTICE**Contaminations of the oil impair the lubricity**

Do not mix the gearbox oil with other substances.

Do not flush with paraffin or other solvents, as traces of these substances will always remain inside the gearbox.

Note

The oil must be warm because insufficient viscosity caused by oil that is too cold impairs correct emptying.

If necessary, run the gearbox for 15 to 30 minutes to become warm.

8.2.5.2 Draining the oil

Observe the symbols in the diagrams of the Mounting positions (Page 87):



Venting



Oil level



Oil drain

Procedure

1. Switch off the power supply to the drive unit.
2. Unscrew the vent plug.
3. Place a suitable and sufficiently large receptacle underneath the oil drain plug.
4. Remove the oil drain plug. Drain all the oil into the receptacle.
5. Check the state of the sealing ring on the sealing element. If the sealing ring is damaged, replace the sealing element with a new one.
6. After draining the oil, seal the gearbox immediately using the sealing element.

You have now drained the oil from the gearbox.

8.2.5.3 Flushing the gearbox when changing between incompatible oils

WARNING

Impermissible mixing of oils leads to damage

Residual quantities of original oil can impair the specific properties of the new oil.

A flushing process is required with biodegradable and physiologically safe oils.

The residual corrosion protection oil must amount to no more than 1% of the operating oil volume.

Note

Polyglycol oil has a higher density than mineral oil. Therefore, it sinks down towards the oil drain and the mineral oil floats on top.

This makes the required complete draining of mineral oil from the gearbox extremely difficult.

Note

After the second flush, we recommend that an appropriate analysis institute checks the quality of the flushed fluid.

Observe the symbols in the diagrams of the Mounting positions (Page 87):



Venting



Oil drain

Procedure

1. After the oil has been drained, wipe the gearbox clean of any remaining mineral oil using a cloth.
2. Unscrew the vent plug.
3. Fill the gearbox with a flushing oil, using a filter (filter mesh max. 25 µm). For the flushing oil, use either the new oil or one that is compatible with the new oil and is less expensive.
4. Operate the gearbox for 15 to 30 minutes under a low load.
5. Place a suitable and sufficiently large receptacle underneath the oil drain plug.
6. Remove the oil drain plug. Drain all the oil into the receptacle.
7. After flushing, immediately seal the gearbox using the sealing element.
8. Repeat this step for the second flushing.

You have now flushed the gearbox twice and can pour in the new oil.

8.2.5.4 Filling in oil

NOTICE

Mixing of different oils impairs the lubricity

When adding oil, use the same oil type and viscosity. If changing mutually incompatible oils, see Flushing the gearbox (Page 68).

Observe the symbols in the diagrams of the Mounting positions (Page 87):



Venting

Procedure

1. Unscrew the vent plug.
2. Fill the gearbox with fresh oil. Use a filler filter with mesh of max. 25 µm.
3. Check the oil level.
4. Top up the oil level if necessary and check it again.
5. Check the state of the sealing ring on the sealing element. If the sealing ring is damaged, replace the sealing element with a new one.
6. After filling with oil, seal the gearbox immediately using the sealing element.

You have now filled up the gearbox with oil.

8.2.6 Topping up with oil

If the mounting position of the gearbox is changed or oil lost because of leakage, check the oil level. If you notice oil escaping, locate the leak and seal the affected area. Top up and check the oil level.

At the time of going to print, the following types of oil are being used when the gearbox is filled for the first time:

CLP ISO VG220: Castrol Alpha SP 220

CLP ISO PG VG220: Castrol Tribol / Optigear Synthetic 1300/220

CLP ISO PG VG460: Castrol Tribol / Optigear Synthetic 1300/460

CLP ISO PAO VG68: Addinol Eco Gear 68S-T

CLP ISO PAO VG220: Addinol Eco Gear 220S

CLP ISO E VG220: Fuchs Plantogear Bio 220S

CLP ISO H1 VG100: Klüber Klübersynth UH1 6 100

CLP ISO H1 VG460: Castrol Tribol Foodproof / Optilep GT 1800/460

If, following agreement, the gearbox is filled at the factory with special lubricant for the special applications referred to above, the lubricant must be shown on the rating plate.

8.2.7 Change the roller bearing grease

The roller bearings are lubricated in the factory with the greases listed in the table.

Renew the grease quantify for grease-lubricated bearings with each oil change.

Clean the bearing before filling it with fresh lubricant.

In the case of bearings on the output shaft or intermediate shafts, the grease quantity must fill 2/3, and in the case of bearings on the input side, 1/3 of the space between the rolling elements.

Table 8- 3 Roller-bearing and shaft-sealing-ring grease

| Fields of application | Ambient temperature | Manufacturer | Type |
|---|---------------------|--------------|---|
| Standard | -40 °C to +80 °C | Klüber | Petamo GHY 133 N |
| Foodstuff-compatible for the food industry | -30 °C to +40 °C | Castrol | Obeen UF F2 NSF H1 / Optileb GR UF 2 NSF H1 |
| Biologically degradable, for agriculture, forestry and water industries | -35 °C to +40 °C | BP | Biogrease EP 2 |

8.2.8 Service life of the lubricants

Note

In case of ambient conditions deviating from normal conditions, e.g. high ambient temperatures, high relative humidity, aggressive ambient media, the intervals between changes should be shorter. In such cases, contact Technical Support for assistance in determining the individual lubricant change interval.

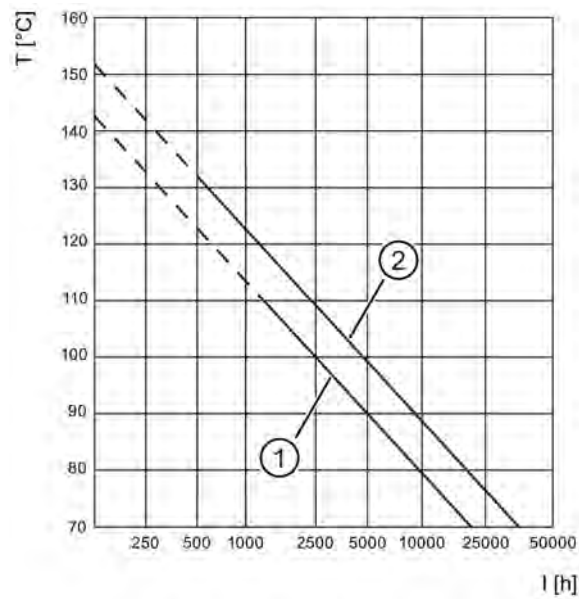
Note

Oil sump temperatures above +80 °C can reduce service life. A temperature increase by 10 K halves the service life by the amount as shown in the figure titled "Guide values for oil change intervals".

For a +80 °C oil sump temperature, the following service life can be expected when observing the properties specified by Siemens AG:

Table 8- 4 Service life of the oils

| Type of oil | Service life |
|---|-----------------------------------|
| Mineral oil | 10 000 operating hours or 2 years |
| Biodegradable oil | |
| Physiologically safe oil according to USDA-H1/-H2 | |
| Synthetic oil | 20 000 operating hours or 4 years |



- ① Mineral oil
 - ② Synthetic oil
- T Oil-bath steady-state temperature [°C]
I Oil change interval in operating hours [h]

Image 8-3 Guide values for oil change intervals


Grease service life of roller bearing greases

Roller bearings and the clearance in front are filled with sufficient grease.

Under approved operating conditions and ambient temperatures, no regreasing is required.

We recommend that the grease in the bearings is also renewed when the oil or shaft sealing rings are replaced.

8.2.9 Recommended lubricants

 **DANGER**

Used lubricants only have conditional approval

The used lubricants are not or only conditionally approved for use in the foodstuff or pharmaceutical industry.

Use only lubricants with USDA (United States Department of Agriculture) H1 / H2 approval for deployment in the foodstuff or pharmaceutical industry.

The released and recommended lubricants are listed in the T 7300 Operating Instructions.

NOTICE

Incorrect operating temperatures impair the lubricity of the gearbox oil

Operating temperatures outside the permitted range impair the lubricating property of the gearbox oil.

The temperature ranges are listed in the T 7300 Operating Instructions, Gearbox Lubrication. If you are working outside the specified temperature ranges, please contact Technical Support for advice on which oil to use.

If the housing temperature exceeds a value of +80 °C, please contact Technical Support.

Note

As standard, the lubricants and shaft seals are harmonized and coordinated with one another corresponding to the prevailing operating conditions.

Contact Technical Support for:

- Change of the operating conditions
- Change in oil grade
- Deployment of new shaft seals.

Note

The lubricants used are not at all or only conditionally biodegradable. If biologically degradable lubricants are required, use only gearbox lubricants with the appropriate classification listed in the T 7300 Operating Instructions.

Note

These recommendations are not a guarantee of the lubricant quality provided by your supplier. All lubricant manufacturers are responsible for the quality of their own products.

The oil viscosity is decisive for the oil selection (ISO VG class). The viscosity is specified on the rating plate of the gearbox. The viscosity class indicated applies for the contractually agreed operating conditions.

In the case of different operating conditions, please contact Technical Support.

If, following agreement, the gearbox is filled at the factory with special lubricant for the special applications referred to above, the lubricant is shown on the rating plate.

The quality of the oil used must comply with the requirements laid down in the BA 7300 Operating Instructions; otherwise, the Siemens warranty is null and void. We recommend the use of an approved gearbox lubricant specified in the T 7300

(<http://support.automation.siemens.com/WW/view/en/44231658>) Operating Instructions.

These oils have been tested appropriately and satisfy the requirements.

The oils listed in the operating instructions are subject to continuous testing. It is possible that the oils recommended in the operating instructions are at a later point in time removed or replaced by oils that have been further developed.

We recommend that you regularly check as to whether the selected lubricating oil is still recommended by Siemens. Otherwise change the product.

8.3 Replace bearings

The bearing service life depends greatly on the operating conditions and so cannot be calculated reliably. In the operating conditions specified by the operator, bearing life can be calculated and indicated on the rating plate. If no information is given, changes in vibration and noise pattern can serve as an indicator that an immediate bearing replacement is necessary.

10.5 Mounting positions

10.5.1 General notes on mounting positions

Only operate the gearbox in the mounting position specified on the rating plate. This ensures that the correct quantity of lubricant is provided. The symbols are shown for the standard mounting position.

Note

Gearbox sizes 19 and 29

Gearbox sizes 19 and 29 are lubricated for life. There is no opening to check the oil level.

In mounting positions M2 and M4 the gearboxes are equipped with a breather valve.

C29 has a breather valve in all mounting positions.

Description of the symbols:



Venting



Oil level



Oil drain

A, B Position of insert shaft / solid shaft

* On opposite side

② Two-stage gearbox

③ Three-stage gearbox

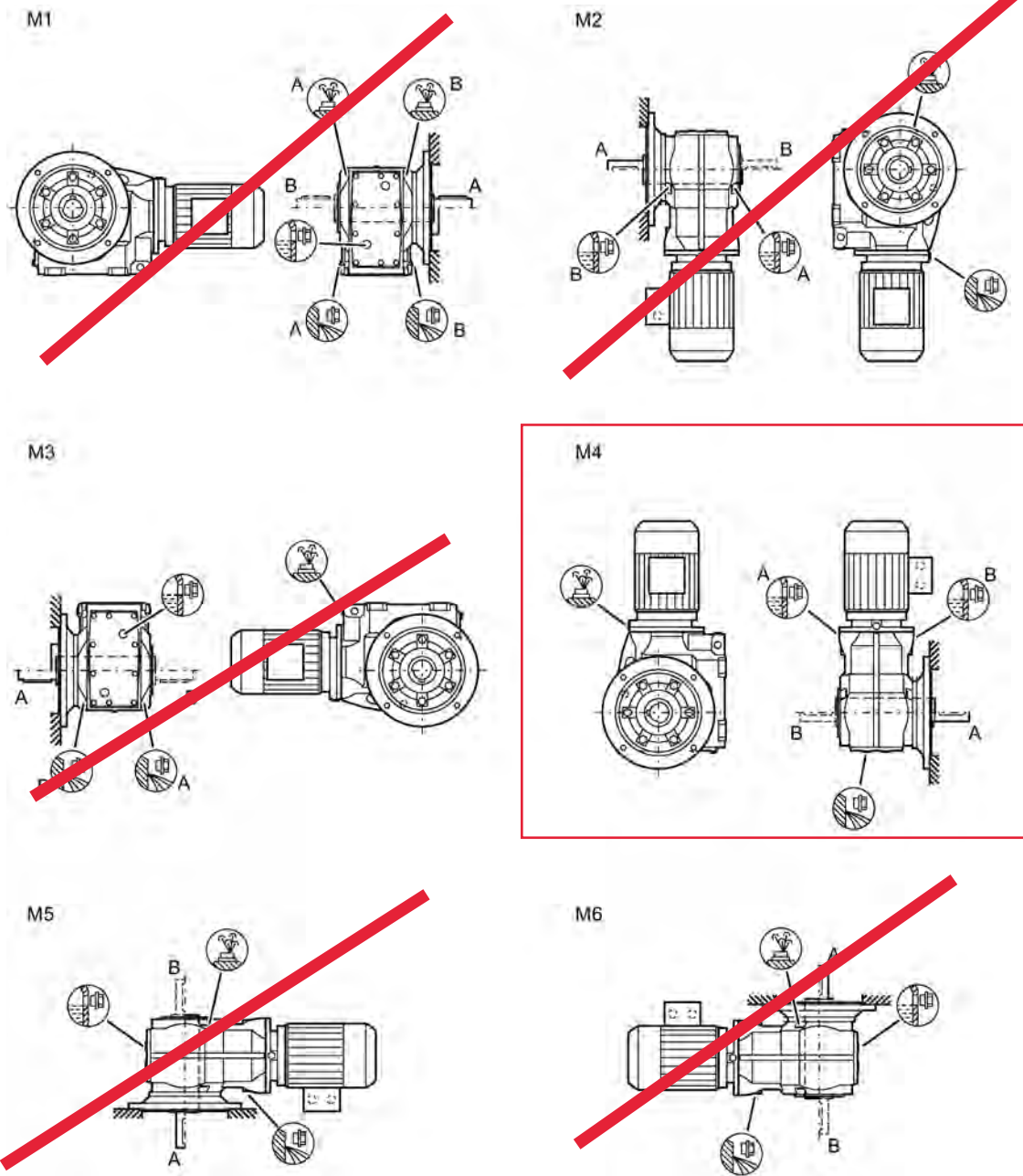


Image 10-23 Mounting positions for bevel gearbox K.F flange-mounted design and KAZ with housing flange, sizes 39 - 189

10.6.2 Parallel shaft gearbox

Table 10- 4 Oil quantities [l] for FD/Z, FD/ZZ, FD/ZA., FD/ZAF., FD/ZAZ., FD/ZAD., sizes 29 - 189

| Type | Mounting position | | | | | |
|--------|-------------------|------|------|------|------|------|
| | M1 | M2 | M3 | M4 | M5 | M6 |
| FD.29 | 0.6 | 0.8 | 0.35 | 0.6 | 0.45 | 0.45 |
| FD.39 | 0.95 | 1.1 | 0.7 | 1.2 | 0.8 | 0.8 |
| FD.49 | 2.1 | 2.3 | 1.5 | 2.3 | 1.5 | 1.5 |
| FD.69 | 2.2 | 2.7 | 1.6 | 2.7 | 1.8 | 1.8 |
| FD.79 | 3 | 3.8 | 2.7 | 3.9 | 2.6 | 2.7 |
| FD.89 | 5.6 | 7.6 | 5.9 | 7.8 | 5.1 | 5.2 |
| FD.109 | 9.5 | 13 | 9.2 | 11.8 | 8.5 | 8.5 |
| FD.129 | 16.1 | 20 | 16.3 | 23.5 | 14.9 | 15 |
| FD.149 | 24.5 | 32.5 | 23 | 34 | 21.5 | 22 |
| FD.169 | 39 | 50 | 37 | 54 | 34.5 | 35.5 |
| FD.189 | 64 | 74 | 48 | 77 | 51.5 | 52 |
| FZ.29 | 0.6 | 0.9 | 0.4 | 0.7 | 0.5 | 0.45 |
| FZ.39 | 0.95 | 1.3 | 0.8 | 1.4 | 0.9 | 0.85 |
| FZ.49 | 1.6 | 2.5 | 1.6 | 2.5 | 1.6 | 1.6 |
| FZ.69 | 2.2 | 2.8 | 1.6 | 2.9 | 1.9 | 1.9 |
| FZ.79 | 2.8 | 4.1 | 2.9 | 4.2 | 2.7 | 2.9 |
| FZ.89 | 4.9 | 7.7 | 5.9 | 8.4 | 5.2 | 5.5 |
| FZ.109 | 9.1 | 13.7 | 9.4 | 13.1 | 9 | 9.3 |
| FZ.129 | 15.6 | 21.5 | 16.7 | 25 | 15.6 | 16.3 |
| FZ.149 | 23.5 | 34 | 24 | 37 | 22.5 | 24 |
| FZ.169 | 38 | 54 | 37.5 | 59 | 36.5 | 38.5 |
| FZ.189 | 57 | 77 | 50 | 80 | 52.5 | 54 |

Table 10- 5 Oil quantities [l] for FD/ZF, sizes 29 - 189

| Type | Mounting position | | | | | |
|--------|-------------------|------|------|------|------|------|
| | M1 | M2 | M3 | M4 | M5 | M6 |
| FDF29 | 0.6 | 0.8 | 0.35 | 0.6 | 0.45 | 0.45 |
| FDF39 | 1 | 1.2 | 0.75 | 1.3 | 0.8 | 0.85 |
| FDF49 | 2.2 | 2.3 | 1.5 | 2.4 | 1.6 | 1.5 |
| FDF69 | 2.4 | 2.8 | 1.6 | 2.9 | 1.9 | 1.9 |
| FDF79 | 3.1 | 3.9 | 2.7 | 4 | 2.7 | 2.6 |
| FDF89 | 5.8 | 7.6 | 5.8 | 8 | 5.2 | 5.2 |
| FDF109 | 9.7 | 13 | 9.2 | 12 | 8.6 | 8.6 |
| FDF129 | 16.4 | 20 | 16.3 | 23.5 | 15.1 | 15.2 |
| FDF149 | 25 | 32.5 | 23 | 35 | 22 | 22.5 |
| FDF169 | 40.5 | 50 | 37 | 56 | 35.5 | 36.5 |

| Type | Mounting position | | | | | |
|--------|-------------------|------|------|------|------|------|
| | M1 | M2 | M3 | M4 | M5 | M6 |
| FDF189 | 60 | 74 | 48 | 79 | 53 | 53 |
| FZF29 | 0.6 | 0.9 | 0.4 | 0.7 | 0.5 | 0.45 |
| FZF39 | 1 | 1.4 | 0.85 | 1.1 | 0.95 | 0.9 |
| FZF49 | 1.8 | 2.4 | 1.5 | 2.6 | 1.6 | 1.6 |
| FZF69 | 2.4 | 2.9 | 1.7 | 3.1 | 2 | 2 |
| FZF79 | 2.9 | 4.2 | 2.9 | 4.3 | 2.9 | 2.8 |
| FZF89 | 5.1 | 7.7 | 5.8 | 8.6 | 5.3 | 5.4 |
| FZF109 | 9.2 | 13.7 | 9.4 | 13.3 | 9.1 | 9.4 |
| FZF129 | 16 | 21.5 | 16.7 | 25.5 | 15.8 | 16.5 |
| FZF149 | 24 | 34 | 24 | 38 | 23 | 24.5 |
| FZF169 | 39.5 | 54 | 37.5 | 61 | 37.5 | 39.5 |
| FZF189 | 60 | 77 | 50 | 82 | 53.5 | 55 |

10.6.3 Bevel gearbox


Table 10- 6 Oil quantities [l] for B., sizes 19 - 49

| Type | Mounting position | | | | | |
|------|-------------------|------|-----|------|------|-----|
| | M1 | M2 | M3 | M4 | M5 | M6 |
| B.19 | 0.15 | 0.3 | 0.4 | 0.5 | 0.3 | 0.3 |
| B.29 | 0.25 | 0.55 | 0.7 | 0.85 | 0.55 | 0.5 |
| B.39 | 0.5 | 0.95 | 1.3 | 1.6 | 0.95 | 0.9 |
| B.49 | 1 | 1.7 | 2.4 | 3.1 | 1.7 | 1.5 |

Table 10- 7 Oil quantities [l] for K, KA, KAS, KAT, sizes 39 - 189

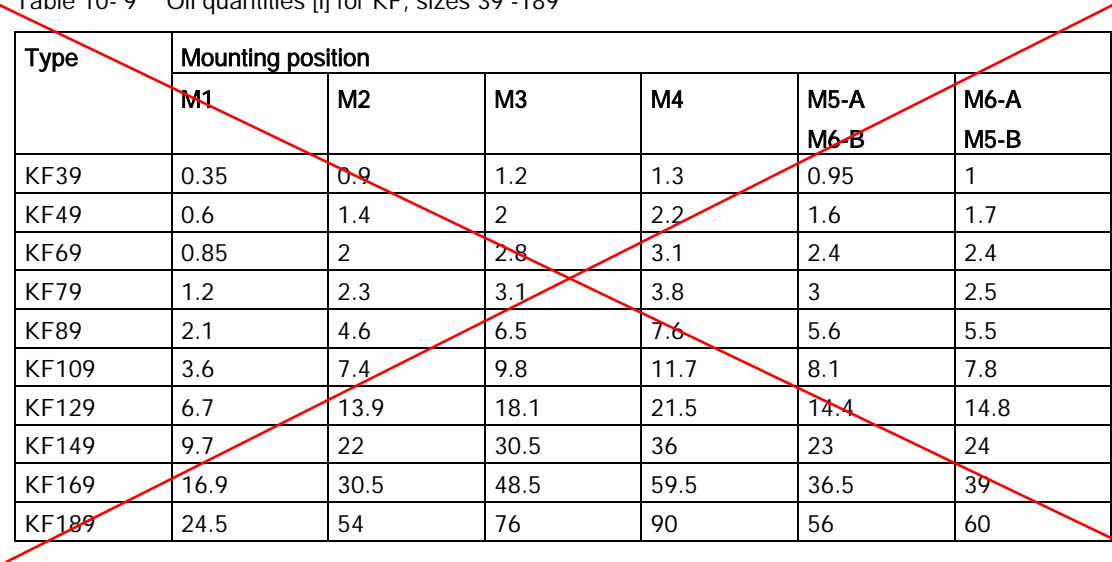
| Type | Mounting position | | | | | |
|-------|-------------------|------|------|------|--------------|--------------|
| | M1 | M2 | M3 | M4 | M5-A M6-B | M6-A M5-B |
| K.39 | 0.35 | 0.85 | 1.1 | 1.2 | 0.85 | 0.9 |
| K.49 | 0.55 | 1.4 | 1.8 | 1.9 | 1.5 | 1.6 |
| K.69 | 0.75 | 2 | 2.5 | 2.7 | 2.2 | 2.2 |
| K.79 | 1 | 2.2 | 2.9 | 3.4 | 2.7 | 2.5 |
| K.89 | 1.9 | 4.5 | 6 | 6.8 | 5 | 5.3 |
| K.109 | 3 | 7.2 | 9.2 | 10.5 | 7.1 | 7.5 |
| K.129 | 5.2 | 13.4 | 16.6 | 19.5 | 13.2 | 13.6 |
| K.149 | 9.3 | 21 | 28 | 33 | 21.5 | 22.5 |
| K.169 | 17 | 31 | 47 | 57.5 | 35.5 | 38.5 |
| K.189 | 24.5 | 53 | 73 | 87 | 53.5 | 59 |

Table 10- 8 Oil quantities [l] for KZ, KAF., KAZ., KAD., sizes 39 - 189



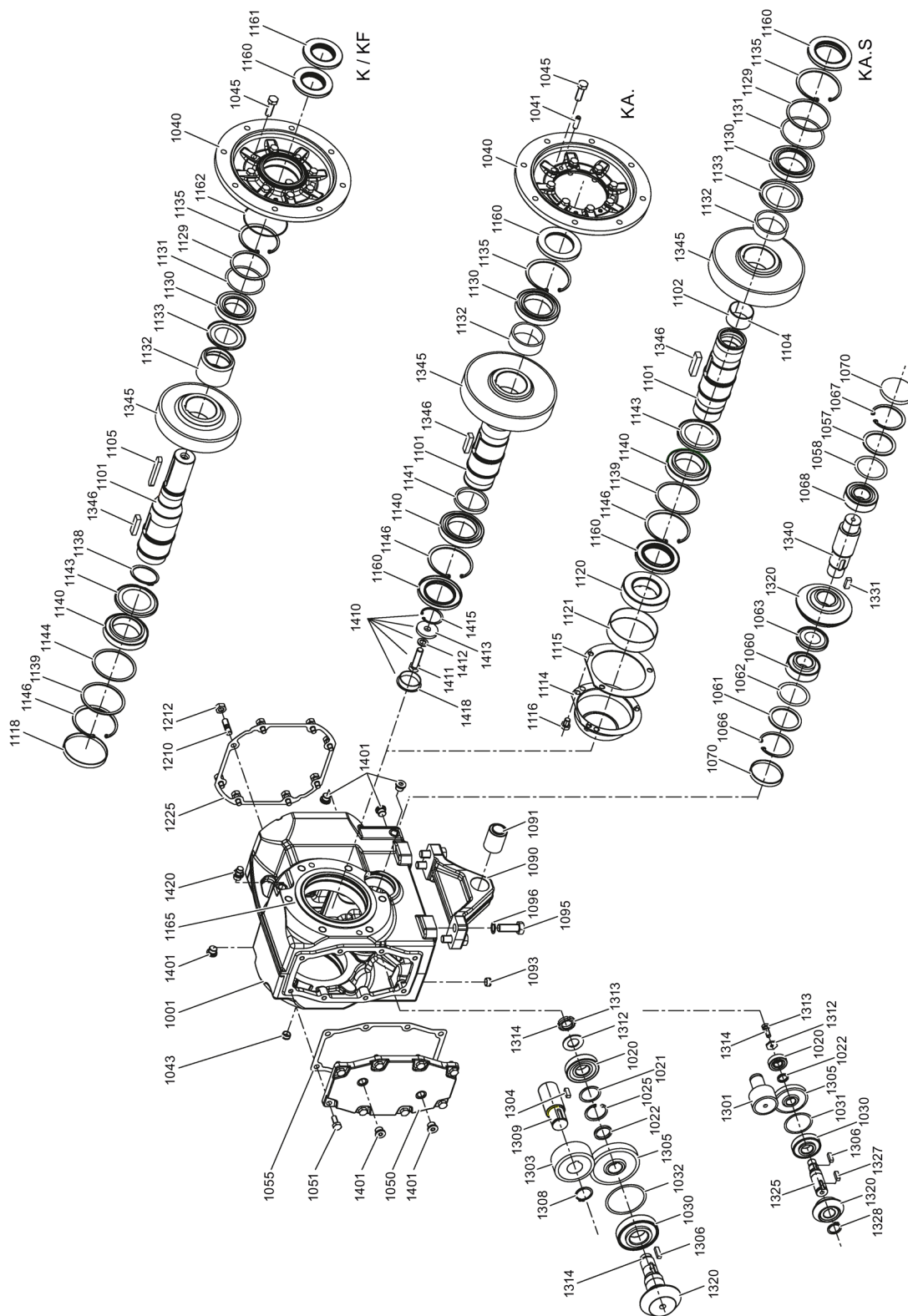
| Type | Mounting position | | | | | |
|-------|-------------------|------|------|------|--------------|--------------|
| | M1 | M2 | M3 | M4 | M5-A M6-B | M6-A M5-B |
| K.39 | 0.4 | 0.9 | 1.2 | 1.3 | 0.95 | 0.95 |
| K.49 | 0.65 | 1.5 | 1.9 | 2.2 | 1.6 | 1.6 |
| K.69 | 0.85 | 2.1 | 2.8 | 3.2 | 2.4 | 2.5 |
| K.79 | 1.1 | 2.4 | 3.1 | 3.7 | 2.5 | 2.7 |
| K.89 | 2.2 | 4.7 | 6.2 | 7.3 | 5.3 | 5.6 |
| K.109 | 3.7 | 7.4 | 9.6 | 11.7 | 7.6 | 8.2 |
| K.129 | 6.5 | 13.5 | 17.5 | 20.5 | 13.8 | 14.2 |
| K.149 | 9.6 | 21.5 | 29 | 34.5 | 22.5 | 23.5 |
| K.169 | 17 | 31 | 47 | 57.5 | 35.5 | 38.5 |
| K.189 | 24.5 | 53 | 73 | 87 | 53.5 | 59 |

Table 10- 9 Oil quantities [l] for KF, sizes 39 -189



| Type | Mounting position | | | | | |
|-------|-------------------|------|------|------|--------------|--------------|
| | M1 | M2 | M3 | M4 | M5-A M6-B | M6-A M5-B |
| KF39 | 0.35 | 0.9 | 1.2 | 1.3 | 0.95 | 1 |
| KF49 | 0.6 | 1.4 | 2 | 2.2 | 1.6 | 1.7 |
| KF69 | 0.85 | 2 | 2.8 | 3.1 | 2.4 | 2.4 |
| KF79 | 1.2 | 2.3 | 3.1 | 3.8 | 3 | 2.5 |
| KF89 | 2.1 | 4.6 | 6.5 | 7.6 | 5.6 | 5.5 |
| KF109 | 3.6 | 7.4 | 9.8 | 11.7 | 8.1 | 7.8 |
| KF129 | 6.7 | 13.9 | 18.1 | 21.5 | 14.4 | 14.8 |
| KF149 | 9.7 | 22 | 30.5 | 36 | 23 | 24 |
| KF169 | 16.9 | 30.5 | 48.5 | 59.5 | 36.5 | 39 |
| KF189 | 24.5 | 54 | 76 | 90 | 56 | 60 |

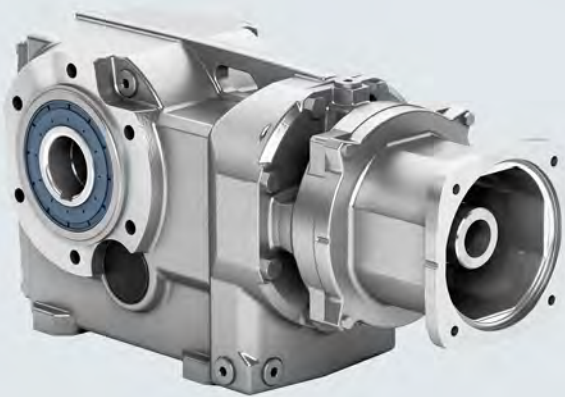
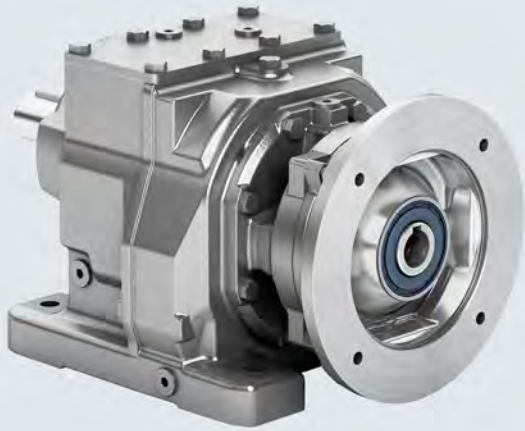
11.2.4 Bevel gearbox K, sizes 39 - 189



| | | | |
|------|------------------------|------|------------------------|
| 1001 | Gearbox housing | 1132 | Supporting disk / shim |
| 1020 | Bearing | 1133 | NILOS ring |
| 1021 | Supporting disk / shim | 1135 | Locking ring |
| 1022 | Supporting disk / shim | 1138 | Locking ring |
| 1025 | Locking ring | 1139 | Supporting disk |
| 1030 | Bearing | 1140 | Bearing |
| 1031 | Supporting disk | 1141 | Supporting disk / shim |
| 1032 | Shim | 1143 | NILOS ring |
| 1040 | Output flange | 1144 | Supporting disk / shim |
| 1041 | Pin | 1146 | Locking ring |
| 1043 | Plug | 1160 | Shaft sealing ring |
| 1045 | Bolt | 1161 | Shaft sealing ring |
| 1050 | Housing cover | 1162 | O ring |
| 1051 | Bolt | 1165 | Seal |
| 1055 | Seal | 1210 | Bolt |
| 1057 | Supporting disk | 1212 | Nut |
| 1058 | Shim | 1225 | Seal |
| 1060 | Tapered roller bearing | 1301 | Plug-in pinion |
| 1061 | Supporting disk | 1303 | Slip-on pinion |
| 1062 | Shim | 1304 | Parallel key |
| 1063 | NILOS ring | 1305 | Helical |
| 1066 | Locking ring | 1306 | Parallel key |
| 1067 | Locking ring | 1308 | Locking ring |
| 1068 | Tapered roller bearing | 1309 | Seal |
| 1070 | Sealing cap | 1312 | Disk |
| 1090 | Torque arm | 1313 | Screw / nut |
| 1091 | Rubber bush | 1314 | Screw lock |
| 1093 | Plug | 1320 | Bevel gear pair |
| 1095 | Bolt | 1325 | Pinion shaft |
| 1096 | Screw lock | 1327 | Parallel key |
| 1101 | Output shaft | 1328 | Locking ring |
| 1102 | Bushing | 1331 | Parallel key |
| 1104 | Seal | 1340 | Pinion shaft |
| 1105 | Parallel key | 1345 | Helical |
| 1114 | Cover NDE | 1346 | Parallel key |
| 1115 | Seal | 1401 | Screw plug |
| 1116 | Bolt | 1410 | Mounting accessories |
| 1118 | Plug / sealing cap | 1411 | Bolt |
| 1120 | Shrink disk | 1412 | Locking ring |
| 1121 | Protective cap | 1413 | Disk |
| 1129 | Supporting disk | 1415 | Locking ring |
| 1130 | Bearing | 1418 | Sealing cap |
| 1131 | Shim | 1420 | Vent filter |

Image 11-5 Bevel gearbox K, sizes 39 - 189

SIEMENS



SIMOGEAR

Adapter for gearbox

BA 2039

Operating instructions

Edition

04/2016

Answers for industry.

3.3 Thread sizes and tightening torques for fastening bolts

The general tolerance for the tightening torque is 10 %. The tightening torque is based on a friction coefficient of $\mu = 0.14$.

Table 3- 1 Tightening torques for fastening bolts

| Thread size | Tightening torque for strength class | | |
|-------------|--------------------------------------|-------|-------|
| | 8.8 | 10.9 | 12.9 |
| | [Nm] | [Nm] | [Nm] |
| M4 | 3 | 4 | 5 |
| M5 | 6 | 9 | 10 |
| M6 | 10 | 15 | 18 |
| M8 | 25 | 35 | 41 |
| M10 | 50 | 70 | 85 |
| M12 | 90 | 120 | 145 |
| M16 | 210 | 295 | 355 |
| M20 | 450 | 580 | 690 |
| M24 | 750 | 1 000 | 1 200 |
| M30 | 1 500 | 2 000 | 2 400 |
| M36 | 2 500 | 3 600 | 4 200 |

3.4 Mounting an input or output element on the gearbox shaft

 **WARNING**

Risk of burns caused by hot parts

Do not touch the gearbox without protection.

NOTICE

Damage to shaft sealing rings caused by solvent

Avoid any contact of solvent or benzine with the shaft sealing rings.

NOTICE

Damage to shaft sealing rings caused by heating

Use thermal shields to protect shaft sealing rings from heating above 100 °C due to radiant heat.

3.5.2 Mount the standard motor to the K4 or K5 short adapter



ATEX version gearboxes

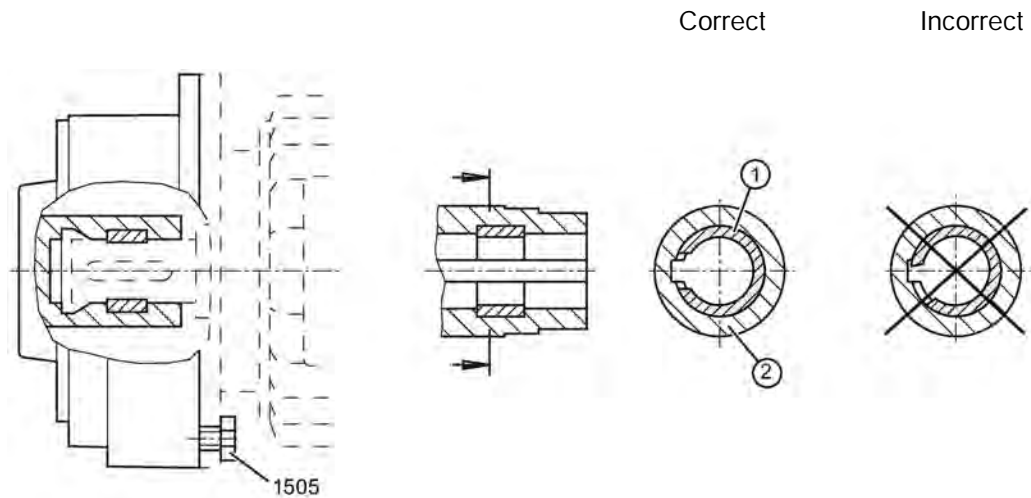
Impacts can cause sparks.

Apply adhesive (medium strength, e.g. Loctite 243) to the bolts 1505.

Note

Ensure that the plastic ring ① is located in the correct position.

The plastic ring ① prevents fretting rust. It does not need to be greased.



- ① Plastic ring
- ② Shaft
- 1505 Bolt

Image 3-4 Plastic ring for K4 and K5

Procedure


1. Check the correct position of the plastic ring ① in the shaft. Correct the position if required.
2. Align the position of the motor shaft so that you can insert it in the shaft ②. The shafts do not need to be greased.
3. Apply adhesive (medium strength, e.g. Loctite 243) to the bolts 1505.
4. Fasten the motor with the bolts 1505 with the prescribed torque. See Thread sizes and tightening torques for fastening bolts (Page 17).

You have mounted the standard motor on the K4 or K5 adapter.

Table 3- 4 Adapter K4

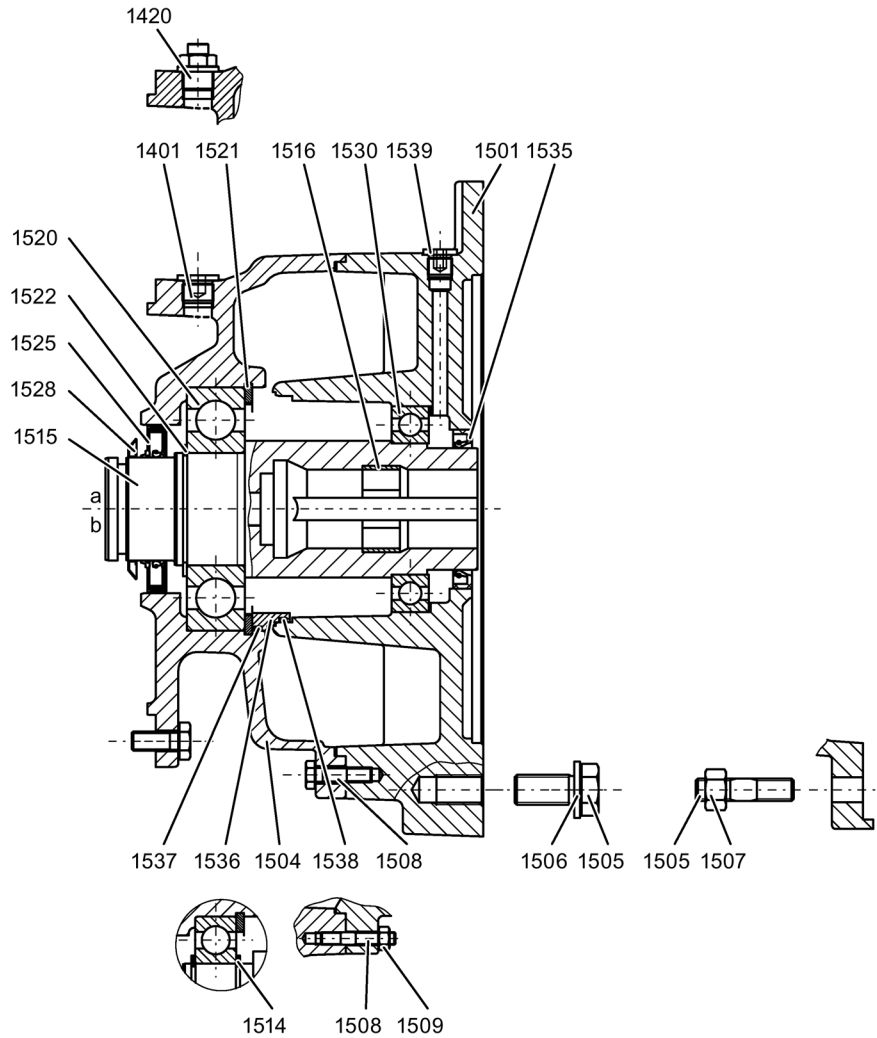
| Coupling size | 63 | 71 | 80 | 90 | 100 | 112 | 132 | 160 | 180 | 200 | 225 | 250 |
|---------------|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Bolt 1505 | M8 | M8 | M10 | M10 | M12 | M12 | M12 | M16 | M16 | M16 | M16 | M16 |

Table 3- 5 Adapter K5



| Coupling size | 56 | 140 | 180 | 210 | 250 | 280 | 320 | 360 |
|------------------------------|------|------|------|------|------|------|------|------|
| Bolt 1505 | 3/8" | 3/8" | 1/2" | 1/2" | 1/2" | 1/2" | 5/8" | 5/8" |
| T _A for 1505 [Nm] | 31 | 31 | 75 | 75 | 75 | 75 | 150 | 150 |

6.2.2 K4 and K5 short adapters with plug-in connection



- | | | | |
|------|----------------------|------|--------------------|
| 1401 | Screw plug | 1520 | Bearing |
| 1420 | Vent filter | 1521 | Locking ring |
| 1501 | Adapter | 1522 | Locking ring |
| 1504 | Bearing shield | 1525 | Shaft sealing ring |
| 1505 | Bolt | 1528 | Disk |
| 1506 | Plate / locking ring | 1530 | Bearing |
| 1507 | Nut | 1535 | Shaft sealing ring |
| 1508 | Bolt | 1536 | Intermediate ring |
| 1509 | Nut | 1537 | O-ring |
| 1514 | Locking ring | 1538 | O-ring |
| 1515 | Shaft | 1539 | Screw plug |
| 1516 | Bush | | |

Image 6-4 K4 and K5 short adapters with clamp connection



Section 6 Parts Lists & Vendor Data

6.3 Anchor Bolt Data



Attached are page(s) from the 2014 Hilti North American Product Tech Guide. For complete details on this product, including data development, product specifications, general suitability, installation, corrosion, and spacing and edge distance guidelines, please refer to the Technical Guide, or contact Hilti.

3.2.3 HIT-HY 200 Adhesive Anchoring System

3.2.3.1 Product description

3.2.3.2 Material specifications

3.2.3.3 Technical data

3.2.3.4 Installation instructions

3.2.3.5 Ordering information



HIT-HY 200-A



HIT-HY 200-R

Listings/Approvals

ICC-ES (International code council)
ESR-3187



Independent code evaluation

IBC®/IRC® 2009

IBC®/IRC® 2006

IBC®/IRC® 2003

LEED® Credit 4.1-Low Emitting Materials

The Leadership in Energy and Environmental Design (LEED®) Green Building Rating system™ is the nationally accepted benchmark for the design, construction and operation of high performance green buildings.



3.2.3.1 Product description

Hilti HIT-HY 200 adhesive is an injectable, two-component, hybrid adhesive. The two components are separated by means of a dual-cylinder foil pack attached to a manifold. The two components combine and react when dispensed through a static mixing nozzle attached to the manifold.

Hilti HIT-HY 200 adhesive is available in two options, Hilti HIT-HY 200-A, and Hilti HIT-HY 200-R. Both options utilize the same technical data. Hilti HIT-HY 200-A will have shorter working times and curing times than Hilti HIT-HY 200-R. The packaging for each is different which helps the user distinguish between the two adhesives.

Hilti HIT-HY 200 adhesive comes with three hole cleaning options:

- The traditional hole cleaning method uses steel wire brushes and compressed air
- The self-cleaning method uses the Hilti TE-CD or TE-YD Hollow Drill Bits in conjunction with a Hilti vacuum to remove the dust as you drill. The hole is clean and ready for anchor installation.
- The no-cleaning method requires the use of Hilti HIT-Z and HIT-Z-R threaded anchor rods. If the base material temperature is less than 41° F (5° C) or if diamond core drilling is used, then the drilled hole must be cleaned.

Elements that are suitable for use with this system are threaded steel rods, Hilti HIS-(R)N steel internally threaded inserts, steel reinforcing bars and Hilti HIT-Z and HIT-Z-R threaded rods.

Product features

- Two great products with equal performance data
- User can select product gel time suitability based on temperature of the base material and jobsite time requirements
- No hole cleaning requirement when installed SafeSet™ hollow drill bit technology
- No hole cleaning requirement when installing HIT-Z rods in dry conditions
- ICC-ES approved for cracked concrete and seismic service
- May be installed in diamond cored holes when additional cleaning steps are employed

Guide specifications

Injectable adhesive shall be used for installation of threaded rods (rebar) (inserts) into existing concrete. Adhesive shall be furnished in containers which keep component A and component B separate. Containers shall be designed to accept static mixing nozzle which thoroughly blends component A and component B and allows injection of the mixed adhesive directly into the drilled hole. Only injection tools and static mixing nozzles supplied by the manufacturer may be used. Injection adhesive shall be formulated to include the resin and hardener to provide optimal curing speed, high strength and stiffness. Injection adhesive anchor system shall be Hilti HIT-HY 200 installed using Hilti Safe Set™ Technology. HIT-HY 200 System shall be supplied by Hilti.

HIT-HY 200 Adhesive Anchoring System 3.2.3

3.2.3.3 Hilti HIT-HY 200-AR Adhesive with Hilti HAS threaded rod



Figure 9 -HAS threaded rod installation conditions









| | | | | |
|---------------------------------|--|--|-----------------------------|--|
| Permissible concrete conditions |  Uncracked concrete |  Dry concrete | Permissible drilling method |  Hammer drilling with carbide tipped drill bit |
| |  Cracked concrete |  Water saturated concrete | |  Hilti TE-CD or TE-YD Hollow Drill Bit |

Table 38 - HAS threaded rod specifications

| Setting information | | Symbol | Units | Nominal rod diameter | | | | | | | | | |
|------------------------------|-------------|--|---------------|----------------------|----------------|--------------------|--------------------|--------------------|--------------------|--------------------|-------|--|--|
| | | | | 3/8 | 1/2 | 5/8 | 3/4 | 7/8 | 1 | 1-1/8 | 1-1/4 | | |
| Nominal bit diameter | | d_o | in. | 7/16 | 9/16 | 3/4 | 7/8 | 1 | 1-1/8 | 1-3/8 | | | |
| Standard effective embedment | | $h_{ef, std}$ | in. (mm) | 3-3/8 (86) | 4-1/2 (114) | 5-5/8 (143) | 6-3/4 (171) | 7-7/8 (200) | 9 (229) | 11-1/4 (286) | | | |
| Effective embedment | minimum | $h_{ef, min}$ | in. (mm) | 2-3/8 (60) | 2-3/4 (70) | 3-1/8 (79) | 3-1/2 (89) | 3-1/2 (89) | 4 (102) | 5 (127) | | | |
| | maximum | $h_{ef, max}$ | in. (mm) | 7-1/2 (191) | 10 (254) | 12-1/2 (318) | 15 (381) | 17-1/2 (445) | 20 (508) | 25 (635) | | | |
| Fixture hole diameter | through-set |  | in. | 1/2 | 5/8 | 13/16 ¹ | 15/16 ¹ | 1-1/8 ¹ | 1-1/4 ¹ | 1-1/2 ¹ | | | |
| Fixture hole diameter | preset |  | in. | 7/16 | 9/16 | 11/16 | 13/16 | 15/16 | 1-1/8 | 1-3/8 | | | |
| Installation torque | | T_{inst} | ft-lb (Nm) | 15 (20) | 30 (40) | 60 (80) | 100 (136) | 125 (169) | 150 (203) | 200 (271) | | | |

¹ Install using (2) washers. See Figure 11.

Figure 10 - HAS threaded rods

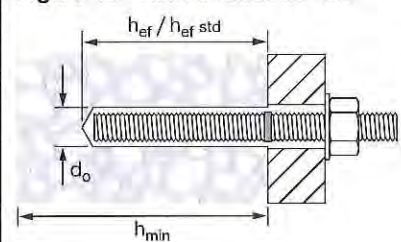


Figure 11 - Installation with (2) washers



3.2.3

HAS-E carbon steel threaded rod specifications

Carbon steel rods conform to ISO 898 class 5.8 with a minimum tensile strength of 72.5 ksi (500 MPa) and a minimum yield strength of 58 ksi (400 MPa).

HAS-E nuts conform to SAE J995 Grade 5.

HAS-E washers conform to ASTM F884, HV, and ANSI B18.22.1 Type A Plain.

HAS-E rod, nut and washer has an electroplated zinc coating conforming to ASTM B633, SC 1.

HAS Super high strength threaded rod specifications

Carbon steel rods manufactured from ASTM A193, Grade B7, with a minimum tensile strength of 125 ksi (862 MPa) and a minimum yield strength of 105 ksi (724 MPa).

HAS Super nuts conform to SAE J995 Grade 5.

HAS Super washers conform to ASTM F884, HV, and ANSI B18.22.1 Type A Plain.

HAS Super rods, nuts and washers, except the 7/8-in. diameter, have an electroplated zinc coating conforming to ASTM B633, SC1.

7/8-in. HAS Super rods, nuts and washers are hot-dip galvanized in accordance with ASTM A153.

HAS-R 304 stainless steel

3/8-, 1/2- and 5/8-in. rods manufactured from AISI Type 304 stainless steel with a minimum tensile strength of 100 ksi (689 MPa) and a minimum yield strength of 65 ksi (448 MPa).

3/4-, 1- and 1 1/4-in. rods are manufactured from AISI Type 304 stainless steel conforming to ASTM F593 Condition CW or cold worked.

AISI Type 304 stainless steel nuts conform to ASTM F594.

AISI Type 304 stainless steel washers conform to ASTM A240 and ANSI B18.22.1 Type A Plain.

HAS-R 316 stainless steel

3/8-, 1/2- and 5/8-in. rods manufactured from AISI Type 316 stainless steel with a minimum tensile strength of 100 ksi (689 MPa) and a minimum yield strength of 65 ksi (448 MPa).

3/4-, 1- and 1 1/4-in. rods are manufactured from AISI Type 316 stainless steel conforming to ASTM F593 Condition CW.

AISI Type 316 stainless steel nuts conform to ASTM F594.

AISI Type 316 stainless steel washers conform to ASTM A240 and ANSI B18.22.1 Type A Plain.

3.2.3 HIT-HY 200 Adhesive Anchoring System

Table 39 - Hilti HIT-HY 200 adhesive design strength with concrete / bond failure for threaded rod in uncracked concrete ^{1,2,3,4,5,6,7,8}

| Nominal anchor diameter in. | Effective embedment in. (mm) | Tension — ΦN_n or N_t | | | | Shear — ΦV_n or V_t | | | |
|-----------------------------|------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| | | $f'_c = 2500$ psi (17.2 Mpa) lb (kN) | $f'_c = 3000$ psi (20.7 Mpa) lb (kN) | $f'_c = 4000$ psi (27.6 Mpa) lb (kN) | $f'_c = 6000$ psi (41.4 Mpa) lb (kN) | $f'_c = 2500$ psi (17.2 Mpa) lb (kN) | $f'_c = 3000$ psi (20.7 Mpa) lb (kN) | $f'_c = 4000$ psi (27.6 Mpa) lb (kN) | $f'_c = 6000$ psi (41.4 Mpa) lb (kN) |
| 3/8 | 2-3/8 (60) | 2,855 (12.7) | 3,125 (13.9) | 3,415 (15.2) | 3,620 (16.1) | 3,075 (13.7) | 3,370 (15.0) | 3,680 (16.4) | 3,900 (17.3) |
| | 3-3/8 (86) | 4,835 (21.5) | 4,855 (21.6) | 4,855 (21.6) | 5,150 (22.9) | 10,415 (46.3) | 10,460 (46.5) | 10,460 (46.5) | 11,085 (49.3) |
| | 4-1/2 (114) | 6,475 (28.8) | 6,475 (28.8) | 6,475 (28.8) | 6,665 (30.5) | 13,945 (62.0) | 13,945 (62.0) | 13,945 (62.0) | 14,785 (65.8) |
| | 7-1/2 (191) | 10,790 (48.0) | 10,790 (48.0) | 10,790 (48.0) | 11,440 (50.9) | 23,245 (103.4) | 23,245 (103.4) | 23,245 (103.4) | 24,640 (109.6) |
| 1/2 | 2-3/4 (70) | 3,555 (15.8) | 3,895 (17.3) | 4,500 (20.0) | 5,510 (24.5) | 7,660 (34.1) | 8,395 (37.3) | 9,690 (43.1) | 11,870 (52.8) |
| | 4-1/2 (114) | 7,445 (33.1) | 8,155 (36.3) | 8,635 (38.4) | 9,150 (40.7) | 16,035 (71.3) | 17,570 (78.2) | 18,595 (82.7) | 19,710 (87.7) |
| | 6 (152) | 11,465 (51.0) | 11,510 (51.2) | 11,510 (51.2) | 12,200 (54.3) | 24,690 (109.8) | 24,795 (110.3) | 24,795 (110.3) | 26,280 (116.9) |
| | 10 (254) | 19,185 (85.3) | 19,185 (85.3) | 19,185 (85.3) | 20,335 (90.5) | 41,320 (183.8) | 41,320 (183.8) | 41,320 (183.8) | 43,800 (194.8) |
| 5/8 | 3-1/8 (79) | 4,310 (19.2) | 4,720 (21.0) | 5,450 (24.2) | 6,675 (29.7) | 9,280 (41.3) | 10,165 (45.2) | 11,740 (52.2) | 14,380 (64.0) |
| | 5-5/8 (143) | 10,405 (46.3) | 11,400 (50.7) | 13,165 (58.6) | 14,300 (63.6) | 22,415 (99.7) | 24,550 (109.2) | 28,350 (126.1) | 30,795 (137.0) |
| | 7-1/2 (191) | 16,020 (71.3) | 17,550 (78.1) | 17,985 (80.0) | 19,065 (84.8) | 34,505 (153.5) | 37,800 (168.1) | 38,740 (172.3) | 41,065 (182.7) |
| | 12-1/2 (318) | 29,975 (133.3) | 29,975 (133.3) | 29,975 (133.3) | 31,775 (141.3) | 64,565 (287.2) | 64,565 (287.2) | 64,565 (287.2) | 68,440 (304.4) |
| 3/4 | 3-1/2 (89) | 5,105 (22.7) | 5,595 (24.9) | 6,460 (28.7) | 7,910 (35.2) | 11,000 (48.9) | 12,050 (53.6) | 13,915 (61.9) | 17,040 (75.8) |
| | 6-3/4 (171) | 13,680 (60.9) | 14,985 (66.7) | 17,305 (77.0) | 20,590 (91.6) | 29,460 (131.0) | 32,275 (143.6) | 37,265 (165.8) | 44,350 (197.3) |
| | 9 (229) | 21,060 (93.7) | 23,070 (102.6) | 25,900 (115.2) | 27,455 (122.1) | 45,360 (201.8) | 49,690 (221.0) | 55,785 (248.1) | 59,130 (263.0) |
| | 15 (381) | 43,165 (192.0) | 43,165 (192.0) | 43,165 (192.0) | 45,755 (203.5) | 92,975 (413.6) | 92,975 (413.6) | 92,975 (413.6) | 98,550 (438.4) |
| 7/8 | 3-1/2 (89) | 5,105 (22.7) | 5,595 (24.9) | 6,460 (28.7) | 7,910 (35.2) | 11,000 (48.9) | 12,050 (53.6) | 13,915 (61.9) | 17,040 (75.8) |
| | 7-7/8 (200) | 17,235 (76.7) | 18,885 (84.0) | 21,805 (97.0) | 26,705 (118.8) | 37,125 (165.1) | 40,670 (180.9) | 46,960 (208.9) | 57,515 (255.8) |
| | 10-1/2 (267) | 26,540 (118.1) | 29,070 (129.3) | 33,570 (149.3) | 37,365 (166.2) | 57,160 (254.3) | 62,615 (278.5) | 72,300 (321.6) | 80,485 (358.0) |
| | 17-1/2 (445) | 57,100 (254.0) | 58,755 (261.4) | 58,755 (261.4) | 62,280 (277.0) | 122,990 (547.1) | 126,545 (562.9) | 126,545 (562.9) | 134,140 (596.7) |
| 1 | 4 (102) | 6,240 (27.8) | 6,835 (30.4) | 7,895 (35.1) | 9,665 (43.0) | 13,440 (59.8) | 14,725 (65.5) | 17,000 (75.6) | 20,820 (92.6) |
| | 9 (229) | 21,060 (93.7) | 23,070 (102.6) | 26,640 (118.5) | 32,625 (145.1) | 45,360 (201.8) | 49,690 (221.0) | 57,375 (255.2) | 70,270 (312.6) |
| | 12 (305) | 32,425 (144.2) | 35,520 (158.0) | 41,015 (182.4) | 48,805 (217.1) | 69,835 (310.6) | 76,500 (340.3) | 88,335 (392.9) | 105,120 (467.6) |
| | 20 (508) | 69,765 (310.3) | 76,425 (340.0) | 76,740 (341.4) | 81,345 (361.8) | 150,265 (668.4) | 164,605 (732.2) | 165,285 (735.2) | 175,205 (779.3) |
| 1-1/4 | 5 (127) | 8,720 (38.8) | 9,555 (42.5) | 11,030 (49.1) | 13,510 (60.1) | 18,785 (83.6) | 20,575 (91.5) | 23,760 (105.7) | 29,100 (129.4) |
| | 11-1/4 (286) | 29,430 (130.9) | 32,240 (143.4) | 37,230 (165.6) | 45,595 (202.8) | 63,395 (282.0) | 69,445 (308.9) | 80,185 (356.7) | 98,205 (436.8) |
| | 15 (381) | 45,315 (201.6) | 49,640 (220.8) | 57,320 (255.0) | 70,200 (312.3) | 97,600 (434.1) | 106,915 (475.6) | 123,455 (549.2) | 151,200 (672.6) |
| | 25 (635) | 97,500 (433.7) | 106,805 (475.1) | 119,905 (533.4) | 127,100 (565.4) | 210,000 (934.1) | 230,045 (1023.3) | 258,260 (1148.8) | 273,755 (1217.7) |

- See section 3.1.7 for explanation on development of load values.
- See section 3.1.7.3 to convert design strength (factored resistance) value to ASD value.
- Linear interpolation between embedment depths and concrete compressive strengths is not permitted.
- Apply spacing, edge distance, and concrete thickness factors in tables 42 - 55 as necessary. Compare to the steel values in table 41. The lesser of the values is to be used for the design.
- Data is for temperature range A: Max. short term temperature = 104° F (40° C), max. long term temperature = 75° F (24° C). For temperature range B: Max. short term temperature = 176° F (80° C), max. long term temperature = 122° F (50° C) multiply above value by 0.80. For temperature range C: Max. short term temperature = 248° F (120° C), max. long term temperature = 162° F (72° C) multiply above value by 0.70. Short term elevated concrete temperatures are those that occur over brief intervals, e.g., as a result of diurnal cycling. Long term concrete temperatures are roughly constant over significant periods of time.
- Tabular values are for dry concrete conditions. For water saturated concrete multiply design strength (factored resistance) by 0.85.
- Tabular values are for short term loads only. For sustained loads including overhead use, see section 3.1.7.5.
- Tabular values are for normal weight concrete only. For lightweight concrete, multiply design strength (factored resistance) by λ_s as follows: For sand-lightweight, $\lambda_s = 0.51$. For all-lightweight, $\lambda_s = 0.45$.

HIT-HY 200 Adhesive Anchoring System 3.2.3

Table 40 - Hilti HIT-HY 200 adhesive design strength with concrete / bond failure for threaded rod in cracked concrete ^{1,2,3,4,5,6,7,8,9}

| Nominal anchor diameter in. | Effective embedment in. (mm) | Tension — ϕN_n or N_t | | | | Shear — ϕV_n or V_t | | | |
|-----------------------------|------------------------------|--|--|--|--|--|--|--|--|
| | | $f'_c = 2500$ psi (17.2 Mpa) lb (kN) | $f'_c = 3000$ psi (20.7 Mpa) lb (kN) | $f'_c = 4000$ psi (27.6 Mpa) lb (kN) | $f'_c = 6000$ psi (41.4 Mpa) lb (kN) | $f'_c = 2500$ psi (17.2 Mpa) lb (kN) | $f'_c = 3000$ psi (20.7 Mpa) lb (kN) | $f'_c = 4000$ psi (27.6 Mpa) lb (kN) | $f'_c = 6000$ psi (41.4 Mpa) lb (kN) |
| 3/8 | 2-3/8 (60) | 1,900 (8.5) | 1,900 (8.5) | 1,900 (8.5) | 2,015 (9.0) | 2,045 (9.1) | 2,045 (9.1) | 2,045 (9.1) | 2,165 (9.6) |
| | 3-3/8 (86) | 2,700 (12.0) | 2,700 (12.0) | 2,700 (12.0) | 2,860 (12.7) | 5,810 (25.8) | 5,810 (25.8) | 5,810 (25.8) | 6,160 (27.4) |
| | 4-1/2 (114) | 3,600 (16.0) | 3,600 (16.0) | 3,600 (16.0) | 3,815 (17.0) | 7,750 (34.5) | 7,750 (34.5) | 7,750 (34.5) | 8,215 (36.5) |
| | 7-1/2 (191) | 5,995 (26.7) | 5,995 (26.7) | 5,995 (26.7) | 6,355 (28.3) | 12,915 (57.4) | 12,915 (57.4) | 12,915 (57.4) | 13,690 (60.9) |
| 1/2 | 2-3/4 (70) | 2,520 (11.2) | 2,760 (12.3) | 2,950 (13.1) | 3,130 (13.9) | 5,425 (24.1) | 5,945 (26.4) | 6,355 (28.3) | 6,735 (30.0) |
| | 4-1/2 (114) | 4,830 (21.5) | 4,830 (21.5) | 4,830 (21.5) | 5,120 (22.8) | 10,400 (46.3) | 10,400 (46.3) | 10,400 (46.3) | 11,025 (49.0) |
| | 6 (152) | 6,440 (28.6) | 6,440 (28.6) | 6,440 (28.6) | 6,825 (30.4) | 13,870 (61.7) | 13,870 (61.7) | 13,870 (61.7) | 14,700 (65.4) |
| | 10 (254) | 10,730 (47.7) | 10,730 (47.7) | 10,730 (47.7) | 11,375 (50.6) | 23,115 (102.8) | 23,115 (102.8) | 23,115 (102.8) | 24,500 (109.0) |
| 5/8 | 3-1/8 (79) | 3,050 (13.6) | 3,345 (14.9) | 3,860 (17.2) | 4,470 (19.9) | 6,575 (29.2) | 7,200 (32.0) | 8,315 (37.0) | 9,625 (42.8) |
| | 5-5/8 (143) | 7,370 (32.8) | 7,590 (33.8) | 7,590 (33.8) | 8,045 (35.8) | 15,875 (70.6) | 16,345 (72.7) | 16,345 (72.7) | 17,325 (77.1) |
| | 7-1/2 (191) | 10,120 (45.0) | 10,120 (45.0) | 10,120 (45.0) | 10,725 (47.7) | 21,790 (96.9) | 21,790 (96.9) | 21,790 (96.9) | 23,100 (102.8) |
| | 12-1/2 (318) | 16,865 (75.0) | 16,865 (75.0) | 16,865 (75.0) | 17,875 (79.5) | 36,320 (161.6) | 36,320 (161.6) | 36,320 (161.6) | 38,500 (171.3) |
| 3/4 | 3-1/2 (89) | 3,620 (16.1) | 3,965 (17.6) | 4,575 (20.4) | 5,605 (24.9) | 7,790 (34.7) | 8,535 (38.0) | 9,855 (43.8) | 12,070 (53.7) |
| | 6-3/4 (171) | 9,690 (43.1) | 10,615 (47.2) | 10,980 (48.8) | 11,635 (51.8) | 20,870 (92.8) | 22,860 (101.7) | 23,645 (105.2) | 25,065 (111.5) |
| | 9 (229) | 14,640 (65.1) | 14,640 (65.1) | 14,640 (65.1) | 15,515 (69.0) | 31,530 (140.3) | 31,530 (140.3) | 31,530 (140.3) | 33,420 (148.7) |
| | 15 (381) | 24,395 (108.5) | 24,395 (108.5) | 24,395 (108.5) | 25,860 (115.0) | 52,550 (233.8) | 52,550 (233.8) | 52,550 (233.8) | 55,700 (247.8) |
| 7/8 | 3-1/2 (89) | 3,620 (16.1) | 3,965 (17.6) | 4,575 (20.4) | 5,605 (24.9) | 7,790 (34.7) | 8,535 (38.0) | 9,855 (43.8) | 12,070 (53.7) |
| | 7-7/8 (200) | 12,210 (54.3) | 12,665 (56.3) | 12,665 (56.3) | 13,425 (59.7) | 26,300 (117.0) | 27,275 (121.3) | 27,275 (121.3) | 28,910 (128.6) |
| | 10-1/2 (267) | 16,885 (75.1) | 16,885 (75.1) | 16,885 (75.1) | 17,900 (79.6) | 36,370 (161.8) | 36,370 (161.8) | 36,370 (161.8) | 38,550 (171.5) |
| | 17-1/2 (445) | 28,140 (125.2) | 28,140 (125.2) | 28,140 (125.2) | 29,830 (132.7) | 60,615 (269.6) | 60,615 (269.6) | 60,615 (269.6) | 64,250 (285.8) |
| 1 | 4 (102) | 4,420 (19.7) | 4,840 (21.5) | 5,590 (24.9) | 6,845 (30.4) | 9,520 (42.3) | 10,430 (46.4) | 12,040 (53.6) | 14,750 (65.6) |
| | 9 (229) | 14,920 (66.4) | 16,340 (72.7) | 16,615 (73.9) | 17,610 (78.3) | 32,130 (142.9) | 35,195 (156.6) | 35,785 (159.2) | 37,930 (168.7) |
| | 12 (305) | 22,150 (98.5) | 22,150 (98.5) | 22,150 (98.5) | 23,480 (104.4) | 47,710 (212.2) | 47,710 (212.2) | 47,710 (212.2) | 50,575 (225.0) |
| | 20 (508) | 36,920 (164.2) | 36,920 (164.2) | 36,920 (164.2) | 39,135 (174.1) | 79,520 (353.7) | 79,520 (353.7) | 79,520 (353.7) | 84,290 (374.9) |
| 1-1/4 | 5 (127) | 6,175 (27.5) | 6,765 (30.1) | 7,815 (34.8) | 9,570 (42.6) | 13,305 (59.2) | 14,575 (64.8) | 16,830 (74.9) | 20,610 (91.7) |
| | 11-1/4 (286) | 20,850 (92.7) | 22,840 (101.6) | 26,130 (116.2) | 27,700 (123.2) | 44,905 (199.7) | 49,190 (218.8) | 56,285 (250.4) | 59,660 (265.4) |
| | 15 (381) | 32,095 (142.8) | 34,840 (155.0) | 34,840 (155.0) | 36,935 (164.3) | 69,135 (307.5) | 75,045 (333.8) | 75,045 (333.8) | 79,545 (353.8) |
| | 25 (635) | 58,070 (258.3) | 58,070 (258.3) | 58,070 (258.3) | 61,555 (273.8) | 125,075 (556.4) | 125,075 (556.4) | 125,075 (556.4) | 132,580 (589.7) |

3.2.3

1 See section 3.1.7 for explanation on development of load values.

2 See section 3.1.7.3 to convert design strength (factored resistance) value to ASD value.

3 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.

4 Apply spacing, edge distance, and concrete thickness factors in Tables 42 - 55 as necessary. Compare to the steel values in table 41.

The lesser of the values is to be used for the design.

5 Data is for temperature range A: Max. short term temperature = 104° F (40° C), max. long term temperature = 75° F (24° C).

For temperature range B: Max. short term temperature = 176° F (80° C), max. long term temperature = 122° F (50° C) multiply above value by 0.80.

For temperature range C: Max. short term temperature = 248° F (120° C), max. long term temperature = 162° F (72° C) multiply above value by 0.70.

Short term elevated concrete temperatures are those that occur over brief intervals, e.g., as a result of diurnal cycling. Long term concrete temperatures are roughly constant over significant periods of time.

6 Tabular values are for dry concrete conditions. For water saturated concrete multiply design strength (factored resistance) by 0.85.

7 Tabular values are for short term loads only. For sustained loads including overhead use, see section 3.1.7.5.

8 Tabular values are for normal weight concrete only. For lightweight concrete, multiply design strength (factored resistance) by λ_s as follows:

For sand-lightweight, $\lambda_s = 0.51$. For all-lightweight, $\lambda_s = 0.45$.

9 Tabular values are for static loads only. For seismic loads, multiply cracked concrete tabular values by the following reduction factors:

3/8-in to 3/4-in diameter - $\alpha_{\text{stab}} = 0.60$

7/8-in to 1-1/4-in diameter - $\alpha_{\text{stab}} = 0.75$

See section 3.1.7.4 for additional information on seismic applications.

3.2.3 HIT-HY 200 Adhesive Anchoring System

Table 41 - Steel design strength for Hilti HAS threaded rods ³

| Nominal anchor diameter in. | HAS-E ⁵ | | | HAS Super ASTM A193 B7 ⁵ | | | HAS SS AISI 304/316 SS ⁵ | | |
|-----------------------------|--|--|--------------------------------|--|--|--------------------------------|--|--|--------------------------------|
| | Tensile ¹ ϕN_{sa} lb (kN) | Shear ² ϕV_{sa} lb (kN) | $\alpha_{seis,V}$ ⁴ | Tensile ¹ ϕN_{sa} lb (kN) | Shear ² ϕV_{sa} lb (kN) | $\alpha_{seis,V}$ ⁴ | Tensile ¹ ϕN_{sa} lb (kN) | Shear ² ϕV_{sa} lb (kN) | $\alpha_{seis,V}$ ⁴ |
| 3/8 | 3,655 (16.3) | 1,685 (7.5) | 0.7 | 7,265 (32.3) | 3,150 (14.0) | 0.7 | 5,040 (22.4) | 2,325 (10.3) | 0.7 |
| 1/2 | 6,690 (29.8) | 3,705 (16.5) | 0.7 | 13,300 (59.2) | 6,915 (30.8) | 0.7 | 9,225 (41.0) | 5,110 (22.7) | 0.7 |
| 5/8 | 10,650 (47.4) | 5,900 (26.2) | 0.7 | 21,190 (94.3) | 11,020 (49.0) | 0.7 | 14,690 (65.3) | 8,135 (36.2) | 0.7 |
| 3/4 | 15,765 (70.1) | 8,730 (38.8) | 0.7 | 31,360 (139.5) | 16,305 (72.5) | 0.7 | 18,480 (82.2) | 10,235 (45.5) | 0.7 |
| 7/8 | 21,755 (96.8) | 12,050 (53.6) | 0.7 | 43,285 (192.5) | 22,505 (100.1) | 0.7 | 25,510 (113.5) | 14,125 (62.8) | 0.7 |
| 1 | 28,540 (127.0) | 15,805 (70.3) | 0.7 | 56,785 (252.6) | 29,525 (131.3) | 0.7 | 33,465 (148.9) | 18,535 (82.4) | 0.7 |
| 1-1/4 | 45,670 (203.1) | 25,295 (112.5) | 0.7 | 90,850 (404.1) | 47,240 (210.1) | 0.7 | 53,540 (238.2) | 29,655 (131.9) | 0.7 |

1 Tensile = $\phi A_{sa,N} f_{tda}$ as noted in ACI 318 Appendix D

2 Shear = $\phi 0.60 A_{sa,V} f_{tld}$ as noted in ACI 318 Appendix D

3 See section 3.1.7.3 to convert design strength (factored resistance) value to ASD value.

4 Reduction factor for seismic shear only. See section 3.1.7.4 for additional information on seismic applications.


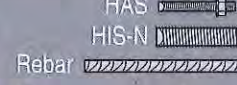





5 HAS Super rods are considered ductile steel elements. HAS standard-E and HAS SS rods are considered brittle steel elements.


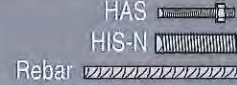





HIT-HY 200 Adhesive Anchoring System 3.2.3

3.2.3.4 Installation instructions

Installation Instructions For Use (IFU) are included with each product package. They can also be viewed or downloaded online at www.us.hilti.com (US) and www.hilti.ca (Canada). Because of the possibility of changes, always verify that downloaded IFU are current when used. Proper installation is critical to achieve full performance. Training is available on request. Contact Hilti Technical Services for applications and conditions not addressed in the IFU.

Figure 14 - HIT-HY 200 adhesive cure time and working time

| HIT-HY 200-A | | | | | |
|---|----------|---|---|---|---|
|  | |  | |  | |
| [°C] | [°F] |  t _{work} |  t _{cure} |  t _{work} |  t _{cure} |
| -10...-5 | 14...23 | 1.5 h | 7 h | - | - |
| -4...0 | 24...32 | 50 min | 4 h | - | - |
| 1...5 | 33...41 | 25 min | 2 h | - | - |
| 6...10 | 42...50 | 15 min | 1.25 h | 15 min | 1.25 h |
| 11...20 | 51...68 | 7 min | 45 min | 7 min | 45 min |
| 21...30 | 69...86 | 4 min | 30 min | 4 min | 30 min |
| 31...40 | 87...104 | 3 min | 30 min | 3 min | 30 min |

| HIT-HY 200-R | | | | | |
|---|----------|---|---|---|---|
|  | |  | |  | |
| [°C] | [°F] |  t _{work} |  t _{cure} |  t _{work} |  t _{cure} |
| -10...-5 | 14...23 | 3 h | 20 h | - | - |
| -4...0 | 24...32 | 2 h | 8 h | - | - |
| 1...5 | 33...41 | 1 h | 4 h | - | - |
| 6...10 | 42...50 | 40 min | 2.5 h | 40 min | 2.5 h |
| 11...20 | 51...68 | 15 min | 1.5 h | 15 min | 1.5 h |
| 21...30 | 69...86 | 9 min | 1 h | 9 min | 1 h |
| 31...40 | 87...104 | 6 min | 1 h | 6 min | 1 h |

Resistance of cured Hilti HIT-HY 200 to chemicals

| Chemical | | Behavior |
|----------------------------------|-----|----------|
| Acetic acid | 10% | + |
| Acetone | | • |
| Ammonia | 5% | + |
| Benzyl alcohol | | - |
| Chloric acid | 10% | • |
| Chlorinated lime | 10% | + |
| Citric acid | 10% | + |
| Concrete plasticizer | | + |
| De-icing salt (Calcium chloride) | | + |
| Deminerlized water | | + |
| Diesel fuel | | + |
| Drilling dust suspension pH 13.2 | | + |
| Ethanol | 96% | |
| Ethylacetate | | - |
| Formic acid | 10% | + |
| Formwork oil | | + |
| Gasoline | | + |
| Glycole | | • |
| Hydrogen peroxide | 10% | • |
| Lactic acid | 10% | + |
| Machinery oil | | + |
| Methylethylketon | | • |
| Nitric acid | 10% | • |
| Phosphoric acid | 10% | + |
| Potassium Hydroxide pH 13.2 | | + |
| Sea water | | + |
| Sewage sludge | | + |
| Sodium carbonate 10% | 10% | + |
| Sodium hypochlorite 2% | 2% | + |
| Sulphuric acid | 10% | + |
| | 30% | + |
| Toluene | | • |
| Xylene | | • |

Key: - non-resistant
+ resistant
• limited resistance

Samples of the HIT-HY 200 adhesive were immersed in the various chemical compounds for up to one year. At the end of the test period, the samples were analyzed. Any samples showing no visible damage and having less than a 25% reduction in bending (flexural) strength were classified as "Resistant." Samples that had slight damage, such as small cracks, chips, etc. or reduction in bending strength of 25% or more were classified as "Limited Resistance" (i.e. exposed for 48 hours or less until chemical is cleaned up). Samples that were heavily damaged or destroyed were classified as "Non-Resistant."

Note: In actual use, the majority of the adhesive is encased in the base material, leaving very little surface area exposed.

3.2.3

3.2.3 HIT-HY 200 Adhesive Anchoring System

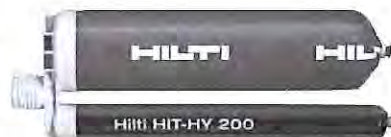
3.2.3.5 Ordering information

Hilti HIT-Z anchor rod

| Description | Bit dia. (in.) | Min. embed. (in.) | Qty |
|-------------------|----------------|-------------------|-----|
| HIT-Z 3/8 x 4 3/8 | 7/16 | 2-3/8 | 40 |
| HIT-Z 3/8 x 5 1/8 | 7/16 | 2-3/8 | 40 |
| HIT-Z 3/8 x 6 3/8 | 7/16 | 2-3/8 | 40 |
| HIT-Z 1/2 x 4 1/2 | 9/16 | 2-3/4 | 20 |
| HIT-Z 1/2 x 6 1/2 | 9/16 | 2-3/4 | 20 |
| HIT-Z 1/2 x 8 | 9/16 | 2-3/4 | 20 |
| HIT-Z 5/8 x 6 | 3/4 | 3-3/4 | 12 |
| HIT-Z 5/8 x 8 | 3/4 | 3-3/4 | 12 |
| HIT-Z 5/8 x 9 1/2 | 3/4 | 3-3/4 | 12 |
| HIT-Z 3/4 x 8 1/2 | 7/8 | 4 | 6 |
| HIT-Z 3/4 x 9 3/4 | 7/8 | 4 | 6 |



HIT-HY 200-A



HIT-HY 200-R

HIT-HY 200-A (accelerated working time)

| Description | Package contents | Qty |
|--|--|-----|
| HIT-HY 200-A (11.1 fl oz/330 ml) | Includes (1) foil pack with (1) mixer and 3/8 filler tube per pack | 1 |
| HIT-HY 200-A Master Carton (11.1 fl oz/330 ml) | Includes (1) master carton containing (25) foil packs with (1) mixer and 3/8 filler tube per pack | 25 |
| HIT-HY 200-A Combo (11.1 fl oz/330 ml) | Includes (1) master carton containing (25) foil packs with (1) mixer and 3/8 filler tube per pack and (1) HDM 500 Manual Dispenser | 25 |
| HIT-HY 200-A Master Carton (16.9 fl oz/500 ml) | Includes (1) master carton containing (20) foil packs with (1) mixer and 3/8 filler tube per pack | 20 |
| HIT-HY 200-A Combo (16.9 fl oz/500 ml) | Includes (2) master cartons containing (20) foil packs each with (1) mixer and 3/8 filler tube per pack and (1) HDM 500 Manual Dispenser | 40 |
| HIT-RE-M Static Mixer | For use with HIT-HY 200-A cartridges | 1 |

HIT-HY 200-R (regular working time)

| Description | Package contents | Qty |
|--|--|-----|
| HIT-HY 200-R (11.1 fl oz/330 ml) | Includes (1) foil pack with (1) mixer and 3/8 filler tube per pack | 1 |
| HIT-HY 200-R Master Carton (11.1 fl oz/330 ml) | Includes (1) master carton containing (25) foil packs with (1) mixer and 3/8 filler tube per pack | 25 |
| HIT-HY 200-R Combo (11.1 fl oz/330 ml) | Includes (1) master carton containing (25) foil packs with (1) mixer and 3/8 filler tube per pack and (1) HDM 500 manual dispenser | 25 |
| HIT-HY 200-R Master Carton (16.9 fl oz/500 ml) | Includes (1) master carton containing (20) foil packs with (1) mixer and 3/8 filler tube per pack | 20 |
| HIT-HY 200-R Combo (16.9 fl oz/500 ml) | Includes (2) master cartons containing (20) foil packs each with (1) mixer and 3/8 filler tube per pack and (1) HDM 500 manual dispenser | 40 |
| HIT-RE-M Static Mixer | For use with HIT-HY 200-R cartridges | 1 |

TE-CD Hollow Drill Bits

| Order Description | Working length (in.) |
|--|----------------------|
| Hollow Drill Bit TE-CD 1/2-13 | 8 |
| Hollow Drill Bit TE-CD 9/16-14 | 9-1/2 |
| Hollow Drill Bit TE-CD 5/8-14 | 9-1/2 |
| Hollow Drill Bit TE-CD 3/4-14 | 9-1/2 |
| Hollow Drill Bit TE-CD 16-A (Replacement collar) | |

TE-YD Hollow Drill Bits

| Order Description | Working Length (in.) |
|--|----------------------|
| Hollow Drill Bit TE-YD 3/4-24 | 15-1/2 |
| Hollow Drill Bit TE-YD 7/8-24 | 15-1/2 |
| Hollow Drill Bit TE-YD 1-24 | 15-1/2 |
| Hollow Drill Bit TE-YD 1 1/8-24 | 15-1/2 |
| Hollow Drill Bit TE-YD 25-A (Replacement collar) | |

HIT-HY 200 Adhesive Anchoring System 3.2.3

Threaded anchors for Hilti chemical anchor systems¹



| HAS-E Rods 5.8 steel | | | HAS Super A193, B7 high strength steel | | HAS-R 304 stainless steel | | HAS-R 316 stainless steel | |
|----------------------|-----|-----|--|-----|---------------------------|-----|---------------------------|-----|
| Description | Qty | Qty | Description | Qty | Description | Qty | Description | Qty |
| 3/8 x 4-3/8 | 10 | 240 | - | - | - | - | - | - |
| 3/8x 5-1/8 | 20 | 200 | 3/8 x 5-1/8 | 20 | 3/8 x 5-1/8 | 20 | 3/8 x 5-1/8 | 20 |
| 3/8 x 8 | 10 | 160 | - | - | 3/8 x 8 | 10 | - | - |
| 3/8 x 12 | 10 | 90 | - | - | - | - | 3/8 x 8 | 10 |
| 1/2 x 3-1/8 | 10 | 240 | - | - | - | - | - | - |
| 1/2 x 4-1/2 | 10 | 160 | - | - | - | - | - | - |
| 1/2 x 6-1/2 | 20 | 160 | 1/2 x 6-1/2 | 20 | 1/2 x 6-1/2 | 20 | 1/2 x 6-1/2 | 20 |
| 1/2x 8 | 10 | 120 | - | - | 1/2 x 8 | 10 | 1/2 x 8 | 10 |
| 1/2 x 10 | 10 | 120 | - | - | 1/2 x 10 | 10 | 1/2 x 11 | 10 |
| 1/2 x 12 | 10 | 80 | - | - | - | - | 1/2 x 12 | 10 |
| 5/8 x 8 | 20 | 80 | 5/8 x 7-5/8 | 20 | 5/8 x 7-5/8 | 20 | 5/8 x 7-5/8 | 20 |
| 5/8 x 9 | 10 | 60 | - | - | 5/8 x 10 | 10 | 5/8 x 9 | 10 |
| 5/8 x 12 | 10 | 60 | - | - | - | - | 5/8 x 12 | 10 |
| 5/8 x 17 | 10 | 40 | - | - | - | - | - | - |
| 3/4 x 10 | 10 | 40 | 3/4 x 9-5/8 | 10 | 3/4 x 9-5/8 | 10 | 3/4 x 9-5/8 | 10 |
| 3/4 x 11 | 10 | 30 | - | - | - | - | 3/4 x 10 | 10 |
| 3/4 x 12 | 10 | 30 | - | - | 3/4 x 12 | 10 | - | - |
| 3/4 x 14 | 10 | 30 | 3/4 x 14 | 10 | 3/4 x 14 | 10 | 3/4 x 16 | 10 |
| 3/4 x 17 | 10 | 20 | - | - | 3/4 x 16 | 10 | - | - |
| 3/4 x 19 | 10 | 20 | - | - | - | - | - | - |
| 3/4 x 21 | 10 | 20 | - | - | - | - | - | - |
| 3/4 x 25 | 10 | 20 | - | - | - | - | - | - |
| 7/8 x 10 | 10 | 20 | 7/8 x 10 HDG | 5 | 7/8 x 10 | 10 | 7/8 x 10 | 10 |
| - | - | - | 7/8 x 12 HDG | 5 | - | - | - | - |
| 7/8 x 13 | 10 | 20 | 7/8 x 16 HDG | 5 | - | - | 7/8 x 16 | 10 |
| 1 x 12 | 4 | 16 | 1 x 12 | 4 | 1 x 12 | 4 | 1 x 12 | 4 |
| 1 x 14 | 2 | 16 | 1 x 14 | 2 | - | - | - | - |
| 1 x 16 | 2 | 12 | 1 x 16 | 2 | - | - | 1 x 16 | 2 |
| 1 x 20 | 2 | 12 | 1 x 21 | 2 | - | - | 1 x 20 | 2 |
| 1-1/4 x 16 | 4 | 8 | 1-1/4 x 16 | 4 | - | - | - | - |
| 1-1/4 x 22 | 4 | 8 | 1-1/4 x 23 | 4 | - | - | - | - |

3.2.3

Hilti Rods are now stamped on the end to show grade of steel and overall anchor length!

E = ISO 898 Class 5.8 Steel

B = ASTM A 193, Grade B7 Steel

R1 = AISI 304 Stainless Steel

R2 = AISI 316 Stainless Steel



HIS-N carbon steel and HIS-RN 316 stainless steel internally threaded inserts¹

| Description | Useable thread length (in) | Qty |
|-------------|----------------------------|-----|
| 3/8 x 4-1/4 | 1 | 10 |
| 1/2 x 5 | 1-3/16 | 5 |
| 5/8 x 6-5/8 | 1-1/2 | 5 |
| 3/4 x 8-1/4 | 2 | 5 |



¹ All dimensions in inches.

3.2.3 HIT-HY 200 Adhesive Anchoring System

Accessories – Dispensers

Battery Powered

Description

HDE 500-A18 Compact Battery Dispenser Kit¹

Includes dispenser, (2) compact B 18 1.6-Ah Li-Ion batteries, C 4/36 battery charger, black and red cartridge holders in a soft bag.



HDE 500-A18 Industrial Battery Dispenser Kit¹

Includes dispenser, (2) industrial B 18 3.3-Ah Li-Ion batteries, C 4/36 battery charger, black and red cartridge holders in a soft bag.



HDE 500-A18 Battery Dispenser Tool Body¹

Includes black and red cartridge holders



Battery Charger C 4/36 Li-Ion 115V

Use with all B 14.4, B 18 batteries or B 36 batteries

Battery Compact 18 1.6-Ah Li-Ion

Battery Industrial B 18 3.3-Ah Li-Ion

HDE 500-A18 Hard Case

Manual

Description

MD 1000 Manual Dispenser¹

For HIT ICE



HDM 500 Manual Dispenser with black foil pack holder

For use with 11.1 fl oz/330 ml and 16.9 fl oz/500 ml foil packs of HIT-HY 150 MAX, HIT-HY 150 MAX-SD, HIT-RE 500, RE 500-SD, HIT-HY 10 PLUS, HIT-HY 70



HDM 500 Manual Dispenser with red foil pack holder

For use with 11.1 fl oz/330 ml and 16.9 fl oz/500 ml foil pack adhesives HY 200-A and HY 200-R



HDM 500 Manual Dispenser with black and red foil pack holder

For use with 11.1 fl oz/330 ml and 16.9 fl oz/500 ml foil pack adhesives HIT-HY 200-A, HIT-HY 200-R, HIT-HY 150 MAX, HIT-HY 150 MAX-SD, HIT-RE 500, HIT-RE 500-SD, HIT-HY 10 PLUS and HIT-HY 70



HIT-CB 500 black cartridge (foil pack) holder replacement

For use with 11.1 fl oz/330 ml and 16.9 fl oz/500 ml foil packs or HIT-HY 150 MAX, HIT-HY 150 MAX-SD, HIT-RE 500, HIT-RE 500-SD, HIT-HY 10 PLUS and HIT-HY 70



HIT-CR 500 red cartridge (foil pack) holder replacement

For use with 11.1 fl oz/330 ml and 16.9 fl oz/500 ml foil pack adhesives HIT-HY 200-A and HIT-HY 200-R



HDM 500 Hard Case Only, no tool

Pneumatic with 1/4 female compressed air coupling

Description

P 3500 Pneumatic Dispenser¹

For use with HIT 11.1 fl oz/330 ml and 16.9 fl oz/500 ml foil pack



HIT-P 8000D Pneumatic Dispenser¹

For use with HIT 47.3 fl oz/1400 ml jumbo foil pack



P 3500 Cartridge (black foil pack) holder replacement

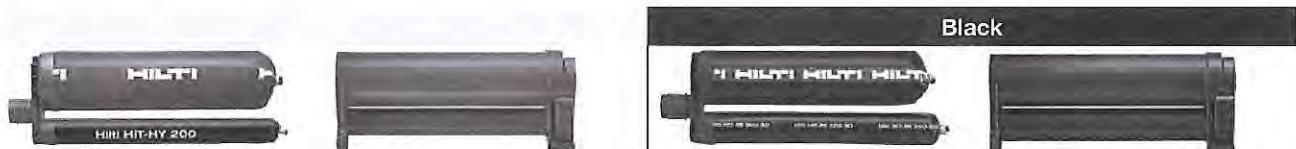
For use with the P 3500 Pneumatic Dispenser and HIT-HY 150 MAX-SD, HIT-HY 150 MAX, HIT-RE 500-SD, HIT-RE 500, HIT-HY 70 and HIT-HY 10 PLUS



¹ Dispensers not compatible with HIT-HY 200 Adhesive Anchor System.

Color coded cartridge holders with the same quality dispenser

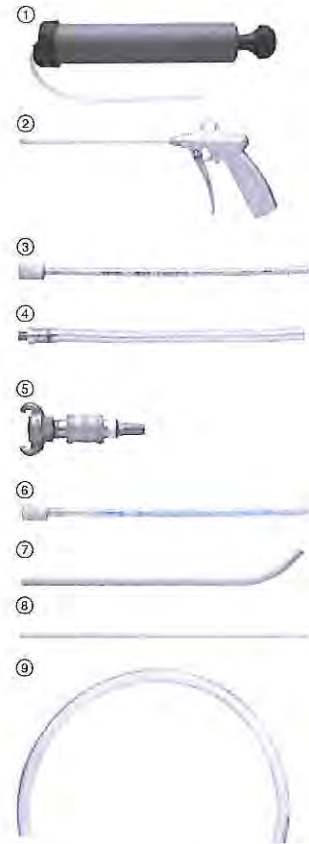
With the introduction of HIT-HY 200 and Safe Set™ Technology, Hilti has introduced a new chemistry with a 5:1 ratio. **All other Hilti adhesive anchor system have a 3:1 mix ratio.** The new technology allows for better performance and both the HDM 500 Manual Dispensers and HDE 500-A18 Battery Dispenser can accept both cartridge ratios. Simply change out the cartridge holder and you can use the dispenser on any jobsite with any Hilti foil pack adhesive.



HIT-HY 200 Adhesive Anchoring System 3.2.3

Hilti HIT Profi Accessories for blowing out drilled holes

| Description | | Diameter in. | Length ft | Qty |
|---|---|--------------|-----------|-----|
| Blow-Out Pump | ① | | | 1 |
| For use in holes up to 10 in. deep | | | | |
| Blow-Out Tool G 1/4 NPT Inlet | ② | | | 1 |
| For use in holes up to 11 in. deep. | | | | |
| For holes deeper than 11 in., use Blow-Out Tool plus the following extensions | | | | |
| Extension hose for blow-out tool HIT-DL 10/0.8 | ③ | 0.39 | 2.6 | 1 |
| Extension hose for blow-out tool HIT-DL 16/0.8 | ④ | 0.71 | 2.6 | 1 |
| 3/8 Claw-type Quick Connect HIT-DL A | ⑤ | | | 1 |
| Extension hose for HIT-DL A HIT-DL V10/1 | ⑥ | 0.39 | 3.3 | 1 |
| Extension tube HIT-DL B (Rigid/bent) | ⑦ | 0.63 | | 5 |
| Extension tube HIT-VL 16/0.7 (Rigid/straight) | ⑧ | 0.63 | 2.3 | 10 |
| Coupler for blowing extensions HIT-DL K | | 0.63 | | 10 |
| Metal coupler for splicing 16 mm extension hose | | | | |
| Extension hose HIT-VL 16 (Flexible) | ⑨ | 0.63 | 33 | 1 |
| HIT-DRS | | | | 1 |
| Dust Removal System with one hole for vacuum attachment and another hole for the Blow-Out Tool. For use with compressed air | | | | |



3.2.3

Air nozzles

Attach to extension end for proper hole cleaning¹

| Description | | Qty |
|-----------------------------------|--|-----|
| HIT-DL 1/2 | | 1 |
| Use with 10 mm diameter hose | | |
| HIT-DL 9/16 | | 1 |
| Use with 10 mm diameter hose | | |
| HIT-DL 11/16 | | 1 |
| Use with 10 mm diameter hose | | |
| HIT-DL 3/4 | | 1 |
| Use with 16 mm diameter hose/tube | | |
| HIT-DL 7/8 | | 1 |
| Use with 16 mm diameter hose/tube | | |
| HIT-DL 1 | | 1 |
| Use with 16 mm diameter hose/tube | | |
| HIT-DL 1-3/8 | | 1 |
| Use with 16 mm diameter hose/tube | | |

¹ HIT-DL size determined by the diameter of drilled hole; see Accessory Selection Table below for proper sizing

Also available in metric!

Round brush²



Piston plug (10 pack)³



Air nozzle



| Hole diameter ¹ | Description | Description | Use with hose dia. | Description |
|----------------------------|--------------|--------------|--------------------|--------------|
| 7/16 | HIT-RB 7/16 | - | - | - |
| 1/2 | HIT-RB 1/2 | HIT-IP 1/2 | 9 mm | HIT-DL 1/2 |
| 9/16 | HIT-RB 9/16 | HIT-IP 9/16 | 9 mm | HIT-DL 9/16 |
| 5/8 | HIT-RB 5/8 | HIT-IP 5/8 | 9 mm | - |
| 11/16 | HIT-RB 11/16 | HIT-IP 11/16 | 9 mm | HIT-DL 11/16 |
| 3/4 | HIT-RB 3/4 | HIT-IP 3/4 | 16 mm | HIT-DL 3/4 |
| 7/8 | HIT-RB 7/8 | HIT-IP 7/8 | 16 mm | HIT-DL 7/8 |
| 1 | HIT-RB 1 | HIT-IP 1 | 16 mm | HIT-DL 1 |
| 1-1/8 | HIT-RB 1 1/8 | HIT-IP 1 1/8 | 16 mm | - |
| 1-1/4 | HIT-RB 1 1/4 | HIT-IP 1 1/4 | 16 mm | - |
| 1- 3/8 | HIT-RB 1 3/8 | HIT-IP 1 3/8 | 16 mm | HIT-DL 1 3/8 |
| 1-1/2 | HIT-RB 1 1/2 | HIT-IP 1 1/2 | 16 mm | - |
| 1-3/4 | HIT-RB 1 3/4 | HIT-IP 1 3/4 | 16 mm | - |

¹ Refer to adhesive anchor system installation instructions to determine the proper hole diameter for the fastening element to be used.

² Attach brush to HIT-RBH T-handle, HIT-RBS or HIT-RBV extensions.

³ Use piston plugs to help prevent air voids during injection.

3.2.3 HIT-HY 200 Adhesive Anchoring System

Hilti HIT Profi Accessories for brushing drilled holes

Manual brush handle for round steel brush

| Description | Qty |
|---|-----|
| HIT-RBH (T-handle) ① Use to clean holes up to 11 in. deep | 1 |



Manual brush extension for round steel brush

| Description | Qty |
|--|-----|
| HIT-RBV 11 in. extension for HIT-RBH (T-handle) ② | 1 |



HOLDERS for brush extension RBS

Connects RBS extension to your Hilti drill for use in cleaning holes

| Description | Qty |
|----------------------------------|-----|
| TE-Y SDS Max connection ③ | 1 |
| TE-C SDS + Connection ④ | 1 |



Extensions for round steel brushes

| Description | Diameter in. | Length ft. | Qty |
|--------------------------|--------------|------------|-----|
| HIT-RBS 10/0.7 ⑤ | 0.39 | 2.3 | 1 |
| HIT-RBS-10/0.35 ⑤ | 0.39 | 1.2 | 1 |



Hilti HIT Profi Accessories for adhesive injection

Extension hoses

For use in holes deeper than 10 in.

| Description | Diameter in. | Length ft. | Qty |
|-------------------------------------|--------------|------------|-----|
| HIT-VL 9/1.0 flexible hose ⑥ | 0.35 | 3.3 | 10 |
| HIT-VL 16/0.7 rigid tube ⑦ | 0.63 | 2.3 | 10 |
| HIT-VL 16 flexible hose | 0.63 | 33 | 1 |



Coupler for injection extensions

| Description | Diameter in. | Qty |
|--|--------------|-----|
| HIT-VL K ⑧ Plastic coupler for connecting 16 mm (0.63 in.) hoses and tubes | 0.63 | 5 |



Overhead injection accessories

| Description | Hole Diameter in. | Qty |
|---------------------------------------|-------------------|-----|
| HIT-OHW overhead wedge ⑨ | 7/16 to 1-1/4 | 100 |
| HIT-OHC1 overhead drip guard ⑩ | 7/16 to 5/8 | 10 |
| HIT-OHC2 overhead drip guard | 11/16 to 1-1/4 | 10 |





Section 6 Parts Lists & Vendor Data

6.4 Additional Vendor Information (if supplied)

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blank.**



Section 7 Electrical Controls & Schematics

7 Electric Controls & Schematics

For AS BUILT electrical information, refer to Section 7 of your Vulcan Multi-Rake Screen O & M manual.



Section 8 Project Data

8 Project Data



Section 8 Project Data

8.1 Warranty (See the following pages)



Warranty

VULCAN INDUSTRIES, warrants all equipment of its own manufacture to be free of defects caused by faulty material or workmanship and shall, of its option, exchange or repair without charge, F.O.B. its factory, such part or parts thereof that prove defective under normal use within twenty-four (24) months from date of actual start-up. **VULCAN INDUSTRIES** obligation under this warranty is limited to the above and does not apply to replacement or repairs which are required as the result of improper installation, misuse, maladjustment, abnormal operating conditions, or lack of routine maintenance. Nor does the warranty include the furnishing of service for maintenance or problems arising from the foregoing causes. No claims for labor or other expenses will be recognized. This warranty is in lieu of and to the exclusion of all other warranties expressed or implied, statutory or otherwise.

VULCAN INDUSTRIES shall not be liable for any claims, losses, labor, expenses or damages, direct or consequential, resulting directly or indirectly from the use of, or the inability to use, its products, or for other consequential loss or damage of any nature arising from any cause.

THIS WARRANTY IS THE SOLE WARRANTY OF VULCAN INDUSTRIES AND ANY OTHER WARRANTIES EXPRESS, IMPLIED IN LAW, IMPLIED IN FACT, INCLUDING WARRANTIES OR MERCHANTABILITY AND FITNESS FOR USE, ARE HEREBY SPECIFICALLY EXCLUDED.

PROJECT: Wichita, KS

PROJECT NO. 19177



Section 8 Project Data

8.2 Project Specifications (See the following pages)

Job Name: Wichita, KS
Job No. 19177

SCREENINGS WASHING & COMPACTING SYSTEM
MODEL #EWP 300-600

1.0 DESIGN REQUIREMENTS

| | |
|--------------------------|--|
| Number of Units: | Two (2) |
| Screenings Capacity: | Up to 53 cubic ft./hr. (batch service) Up to 159 cubic ft./hr. (continuous service) |
| Organic Removal: | up to 90% |
| Min. Volume Reduction: | up to 50% |
| Wash Water Requirements: | 27 gpm max. (at 35-psi min., 55-psi max.) (intermittent usage) |
| Drive Motor, HP: | 7.5 |
| Water Line Connection: | 1" NPT |
| Net Weight: | 2,050 lb. |

2.01 GENERAL

- A. The washing press shall be provided to reduce the organic content, moisture content and volume of screenings material from a mechanical bar screen. Screenings material shall enter the inlet hopper and be transported by the rotating screw into the washing zone. In the washing zone, wash water is sprayed through the hollow shaft screw and into the screenings material to help dissolve and remove organic material.
- B. During normal flow conditions, the washing press shall be operated in a forward and reverse sequence. The screenings will be transported to washing zone and the screw shall stop rotation. Wash water is then injected through the hollow shaft screw and into the screenings. The screw will then reverse, bring the screenings out of the washing zone and stop rotation to allow the washing zone to be flushed. The screw operates in the forward direction and repeats the washing sequence. This adjustable washing process shall be repeated a minimum of four times to ensure thorough cleaning of the screenings material. During peak loading conditions, the washing process shall automatically switch to operate in the forward direction to handle the larger amount of screenings with only short intervals of reversing to ensure that

material does not accumulate on the shaft of the screw. Four manual ball valves shall be provided, one for each solenoid valve, to allow personnel to isolate the solenoid valves or throttle the amount of wash water.

2.02 INLET HOPPER

- A. The inlet hopper shall be designed to direct screenings material from the screw conveyor into the screw housing. The inlet hopper shall be constructed as shown on the submittal drawings. All materials of construction shall be of 316 stainless steel. All attachment hardware shall be of 316 stainless steel.

2.03 SCREW HOUSING

- A. The screw housing and associated components shall be constructed of 316 stainless steel. The inlet flange shall have a minimum thickness of 3/4-inch and the outlet flange shall have a minimum thickness of 9/16-inch. The outlet flange shall incorporate a 12-inch pipe bolt pattern for connection to the discharge pipe.
- B. The dewatering section shall incorporate anti-rotation bars around the complete circumference to contain the screenings material and prevent rotation of the screenings during the dewatering process. Counter sunk perforations shall be provided in the dewatering zone to allow the removal of the filtrate during compaction. Wash water inlets shall be provided on the top of the washing zone and on the top of the dewatering zone for automatic periodic flushing.
- C. The removable cover for the dewatering section shall be held in place by a latching system to allow easy removal. A resilient seal shall be mounted to the cover to form a watertight seal with the screw housing. Designs that utilize covers that rely on tools for removal or designs where the cover is not removable are not acceptable.
- D. The bottom of the housing shall contain a 1/2-inch thick, 316 stainless steel wedge wire section for drainage. The wedge wire section shall be constructed of individual profiled bars and shall have 2 mm linear openings. Round or slotted perforated holes in the drainage area are specifically excluded.

2.04 HOLLOW SHAFT SCREW

- A. The hollow-shaft screw shall be constructed of alloy steel and it shall have a minimum outside diameter of 11.5 inches. The shaft shall be a minimum of 2-1/2 inches in diameter. The shaft shall be hollow with

perforations located in the washing zone to allow wash water to be injected into the screenings from the inside out.

- B. The flights shall be cold formed from a continuous length of AISI 8620 steel bar with a minimum thickness of 3/4-inch. After fabrication the screw shall be precision machined to ensure that it is concentric along its length. The distance between the flights shall be arranged to allow transportation into the washing zone and compaction in the dewatering zone.
- C. The screw shall have a minimum Brinell hardness of 200 and hard facing shall be applied to the end of the screw to extend the useful service life.
- D. A stainless steel reinforced nylon brush shall be attached to the hollow shaft screw with setscrews in the drainage area to help prevent debris from blinding the drain. To reduce wear on the brush, the design shall be such that the screw shall not be allowed to rest in the press housing. The screw shall be fully supported and cantilevered off of the thrust bearing.

2.05 THRUST BEARING

- A. An independent, stainless steel axial thrust bearing shall be flange mounted to the drive and flange mounted to the press body. The thrust bearing shall fully support the screw and handle the load created during compaction and reversal of the screw. The thrust bearing shall have a fabricated stainless steel housing and shall utilize self-aligning double tapered roller bearings located between two sets of double lip seals. The flanges on the housing shall have a 7/16-inch minimum thickness.
- B. An O-ring seal shall be mounted in a machined groove on the face of the bearing to seal against the press body. The screw shall be cantilevered off the thrust bearing to prevent the screw from resting inside the screw housing.

2.06 DRIVE ASSEMBLY

- A. The washing press shall be complete with an integrated drive assembly consisting of a Class 1, Division 1, Group C & D, explosion-proof electric reversing motor close-coupled to a gear reducer.
- B. The motor shall be 7.5 horsepower, 230/460 volt, 3 phase, 60 Hertz with a service factor of 1.15. The motors shall be rated at 50°C

ambient with Class F insulation and shall have a Class B temperature rise at full load. The nominal motor speed shall be 1800 rpm.

- C. The gear reducer shall be a right-angle helical bevel gear reducer. Gear reducer specifications shall be as shown in section 3.
- D. Gear reducers shall have ball or roller bearings throughout with all moving parts immersed in oil. Gears shall be of alloy steel with threads precision ground and polished after casehardening. Shafts shall be of high strength alloy steel ground to required tolerances. All ball or roller bearings shall be rated and manufactured by a member of the Antifriction Bearing Manufacturer's Association. At least one bearing on each shaft shall be of the combined radial and thrust type.

2.07 DRAIN PAN

- A. A drain pan shall be mounted to the bottom of the screw housing along the full length of the housing. The pan shall be sloped towards the drain and it shall be provided with a flushing nozzle on the dewatering end and a 4-inch diameter drainpipe on the drive end. The pan shall be held in place by a latching system to allow fast and easy removal.
- B. The drain pan shall incorporate a resilient seal along its top edge to form a watertight seal with the screw housing. The drain pan shall be constructed of 316 stainless steel

2.08 DISCHARGE PIPE

- A. The discharge pipe shall be mounted to the pipe flange on the press body and designed to transport the washed, dewatered and compacted screenings to the appropriate receiving device. The discharge pipe shall be constructed of minimum 11-gauge 316 stainless steel pipe and fabricated, UHMW lined U-trough and shall be configured as shown on the Submittal Drawings.

2.09 FREEZE PROTECTION

- A. An insulated heat tracing system shall be provided on the exterior portion of the horizontal U-trough portion of the discharge piping. The U-trough shall be insulated and heat traced along the bottom circular portion of the trough. The heated portion shall extend from the inside face of the exterior wall to the point of discharge. The heat tracing and insulation shall be enclosed with a removable 316 stainless steel cover.

2.10 CONTROLS & ELECTRICAL SAFETY EQUIPMENT

A. Controls shall be supplied as shown in section 5.

2.11 WASH WATER MANIFOLD

A. Four (4) brass body explosion-proof solenoid valves, four (4) manual stainless steel ball valves and a pressure gauge shall be provided as part of a valve wash water manifold. The solenoid valves shall be activated by the PLC in the main control panel to provide wash water intermittently during cleaning and flushing cycles. The wash water manifold shall be mounted on a floor mounted 316 stainless steel support stand. Wash water manifold details are shown in section 5.

2.12 FASTENERS

A. All fasteners and anchor bolts shall be 316 stainless steel unless otherwise indicated in this specification. Anchor bolts shall be provided by the manufacturer for mounting the washing press and the solenoid valve manifold/local control station support stand. All threaded fasteners shall be coated with a nickel based anti-seize thread lubricant prior to assembly.

2.13 LUBRICATION

A. The manufacturer shall state in the operating manual the amount of and specification for any lubricant required.

2.14 PROTECTIVE COATINGS

A. Stainless steel and plastic components shall not be painted. The stainless steel structural components and enclosure panels shall be bead blasted and passivated as required after fabrication to remove embedded iron, surface rust and weld burn. All other surfaces shall be blast cleaned to an SSPC-SP6 finish, removing all dirt, rust, scale and foreign materials.

B. Cleaned surfaces shall be shop primed with one (1) coat of TNEMEC 69-1212 primer, or equal, to attain a minimum dry film thickness of 2.5 mils. The motor and gearbox shall have one coat, 2.5 mils DFT, Tnemec series N69 primer and two coats, 5 mils DFT, Tnemec series 1074 topcoat. The top coat shall be red in color and semi-gloss in finish.

2.15 SPARE PARTS

A. The Manufacturer shall furnish the following spare parts for each press.

1. One (1) replacement brush for screw
2. One (1) set of replacement fuses (1 of each type and size used)

All spare parts shall be properly packed in a white wooden box, labeled and stored where directed by the Owner or Engineer.

3.01 TESTING

A. The washing press shall be factory assembled and factory run tested for a minimum of 8-hours in the United States prior to shipment. The main control panel shall also be factory tested prior to shipment.

3.02 INITIAL START-UP AND TRAINING

A. The Contractor shall provide the services of a factory-employed service technician who shall adequately inspect the installation, test the equipment furnished under this Contract and instruct the Owner's operating personnel in its maintenance and operation. The services of the technician shall be provided as follows:

Two (2) trips, total of three (3) 8-hour days of service to inspect and certify the installation prior to startup and provide Owner's personnel in proper operation and maintenance of the equipment. Start-up service shall be combined with the start-up service for the bar screen and conveyor.



Section 8 Project Data

8.3 General Arrangement Drawing (See the following pages)

For AS BUILT drawing(s) refer to Section 8, 8.3 of your Vulcan Multi-Rake Screen O & M manual.



Section 8 Project Data

- 8.4 Start-up Documents**
To be inserted by Contractor after Installation
(See the following pages)

**General Safety
Instructions**

**Technical & Functional
Description**

Receiving and Storage

**Installation & Start-up
Instructions**

**Maintenance
Instructions &
Lubrications Charts**

**Drive System
Components &
Replaceable Parts**

**Specifications &
Installation Drawings**

**Electrical Control &
Schematics**

Vulcan Shaftless Screw Conveyor

Section 1

General Safety Instructions

1. General Safety Instructions

Before performing any maintenance or repairs to the equipment, personnel should review all governing Safety policies in effect. Note that the material handled by the equipment may come under the classification " **Bio-hazardous material** ". Additionally, the equipment may be controlled by remote controls, and can **start automatically** at any time. Follow the established "Lock out Tag out" procedures to isolate the equipment and prevent automatic starts, prior to performing any work on the equipment.

Caution, the conveyor can start automatically!

In general the following safety precautions must be observed:

- ❑ Screw conveyors are shipped with warning labels affixed at appropriate locations. **DO NOT PAINT OVER WARNING LABELS!** If labels are torn or difficult to read, contact the factory to obtain new warning labels.
- ❑ Ensure that persons cannot be put at risk when working on or in the machine.
- ❑ Before performing any maintenance, the power must be turned off to the main control panel. Follow your local "lock out – tag out" procedure to make sure there is no possibility of the equipment starting, or being connected back to power until all necessary work is performed.
- ❑ Only trained electricians should be allowed to make adjustments or repairs on any part of the electrical system.
- ❑ Protective covers and guards may be removed only after the power has been disconnected. All protective covers and guards must be in place before operating the equipment.
- ❑ Do not attempt any repairs or adjustments while the machine is in operation.
- ❑ Check all safety devices for proper operation.

A safety training and safe equipment operation program should be developed and presented to all personnel involved in the operation and maintenance of the equipment. The Conveyor Equipment Manufacturer's Association (CEMA), Rockville MD, has produced an audio-visual presentation titled "Safe Operation of Screw Conveyors – Three Basic Rules". Owners are encouraged to purchase and use this presentation to augment safety training.

At a minimum, the following warning signs must be attached to the machine:



Bio-hazardous material



Safety instruction



**Automatic Starting
Danger of pinching**

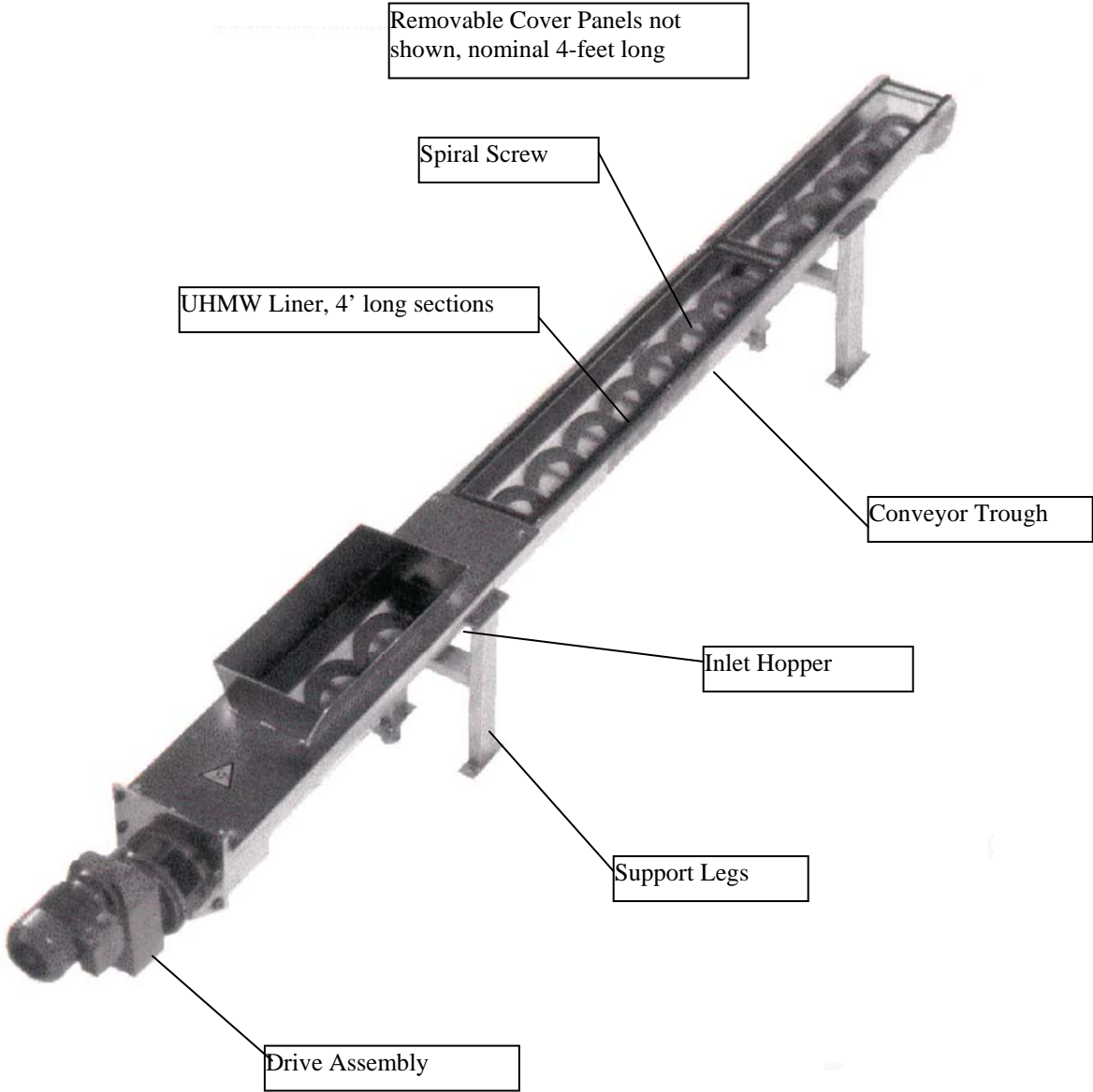
Vulcan Shaftless Screw Conveyor

Section 2

Technical & Functional Description

2a. Functional description

The spiral conveying system consists of a slowly rotating shaftless spiral which is placed in a lined “U” trough, or a lined pipe. The lining is a UHMW material. The spiral lies over the entire length of the liner. The large cross section of the spiral allows for very high axial loading. Thus the conveyor can handle high loading or long runs. The gear drive is located at the receiving end of the conveyor. The thrust is carried by the tapered bearings in the gear box at the drive end. This leaves the discharge free of hanger bearings or drive components, so that the conveyor can discharge directly out the end without obstruction.



Shaftless Screw Conveyor Major Components

The discharge end of the conveyor may be fitted with an optional compaction head. The compaction head dewateres and compacts by means of a weighted flap, which presses against the conveyed material. Excess moisture is pressed out of the screenings in a cylindrical, perforated section at the discharge end of the conveyor.

Under normal operation, the conveyor can be run continuously, or integrated with the feed source. Automatic and manual controls are available, as well as safety devices and alarms.

The conveyor should not be used to convey materials other than what it was designed for.

The feed rate to the conveyor should not exceed the rated capacity of the conveyor.

If the conveyor is used to charge another piece of equipment, the conveyor should not be run if the other equipment fails for any reason.

If the conveyor has set idle for long periods of time, the trough should be examined for dried residue. The residue should be removed, and the spiral should be observed for free rotation in the trough.

Vulcan Shaftless Screw Conveyor

Section 3

Receiving & Storage

3. Receiving and storage

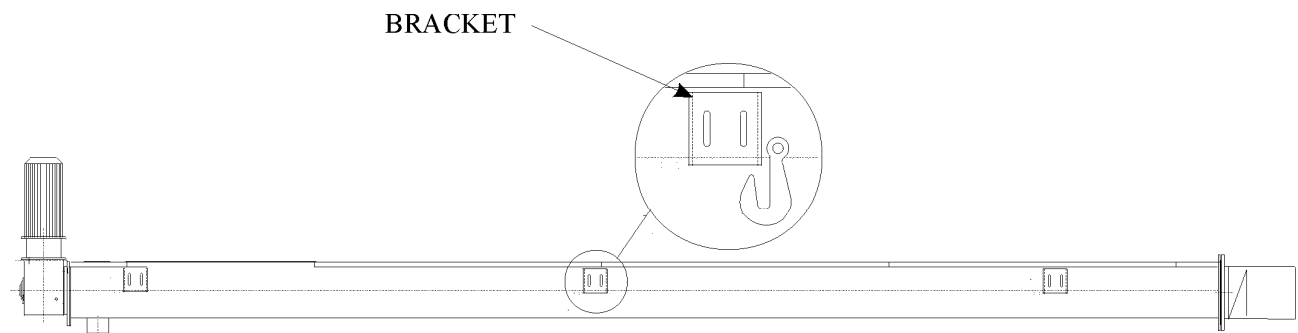
Weight of machine and space requirements can be found in Section 7 of this document. Review this section before receipt of equipment so that any rigging requirements may be met.

The machine is to be handled with care when unloading, transporting, storing and installing, and to be protected from damaging impact from other sources. The machine must be checked for transport damage immediately upon receipt. Contact **Vulcan Industries** if there are any concerns. Do not unload if damage is apparent, unless directed to do so by Vulcan Industries.

An example sheet of a standard Packing List and examples of the tagging system are included with this document. Please take the time to go through the packing list, and identify all items there noted. Contact **Vulcan Industries** if any discrepancies are found.

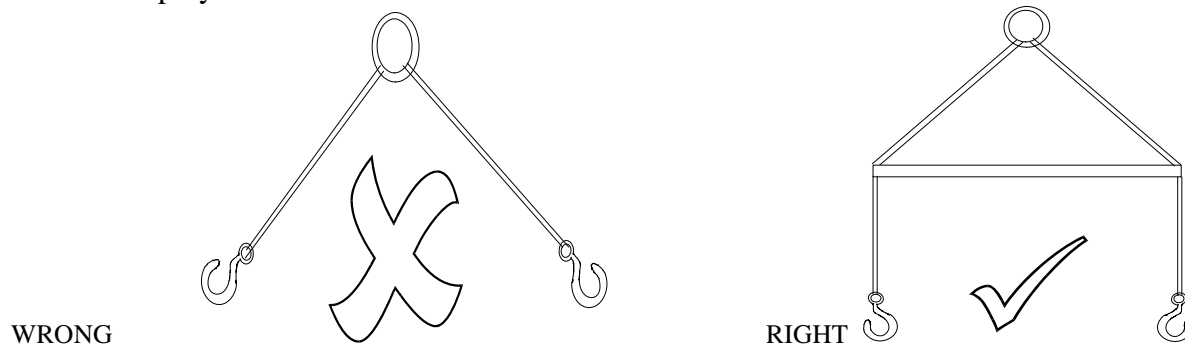
During transport or storage other containers must not be piled on the machine.

The use of lift trucks / fork lifts is acceptable for off loading or transport if the equipment is in its original shipping container. Cranes or other lifting devices are to be used at the following lifting points:



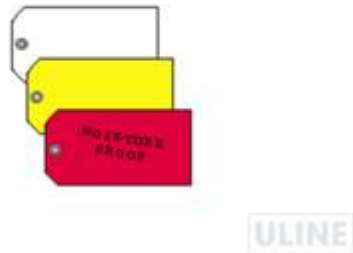
USE SUPPORT LEG BRACKETS FOR LIFTING POINTS

The use of chokers or slings is strictly prohibited for unloading, transport, or installation. Spreader bars must be employed.



TAGGING SYSTEM EXAMPLE SHEET

Model No: **S-5544R 4.75 x 2 3/8 Red Plastic Tag 100/bd**
Yellow Tags used on miscellaneous parts "not generally used"



- PLASTIC TAGS
- Durable, economical tags.
- Color code inventory and equipment.
- Tearproof 10 mil vinyl.
- Metal eyelet.
- Ideal for use with permanent markers.
- Please specify: Red, Yellow, White, Blue or Green.

Model No: **H-543 Uline Plastic Truck Seals –**
Yellow Tags used on pallets and screens.



- TAMPER RESISTANT
- Seals are consecutively numbered and embossed with either "ULINE" or your custom wording (up to 17 s)
- Self-locking seal.
- ULINE PLASTIC SEALS: Minimum order of 300
- Colors available: Red, Yellow, Blue or White.

Model No: **S-6000 1.5 x 1" Consecutive Number Labels,**
0001 - 0500 500/rl

Used to inventory spare parts box and other miscellaneous boxes

VULCAN INDUSTRIES INC.
P O BOX 390/212 S. KIRLIN
MISSOURI VALLEY, IOWA
51555 U.S.A.
712.642.2755 or fax 712.642.4256

PACKING LIST

| | | | | |
|---|-------------------------|---|------------------------|------------|
| Purchase Order No. contract # | DATE SHIPPED (M/D/Y) | SHIPPED VIA Vulcan Industries | OUR NO. #### | L/C NUMBER |
|---|-------------------------|---|------------------------|------------|

| | | |
|---|--|---|
| SHIP TO: (Contractor Name) (Project Name) (Shipping Address). Attn: (Contact Person) | | NOTE: The Spare Parts Box and Local Stations MUST be stored INDOORS! |
|---|--|---|

DO NOT ALLOW CRATES TO BE FLOODED and/or WEATHERED!

| ITEM # | QTY | DESCRIPTION | WEIGHT | | |
|-------------------------------------|----------|--|-------------------------------------|---|------------------------------------|
| Delivered on Vulcan Flat Bed | | | | | |
| | 2 | EWP 250-1200 Wash Press w/ Inlet Hoppers Attached | 1800 | | |
| | 2 | 12' Long "U" Troughs | 550 | | |
| | 2 | 6' Long "U" Troughs | 275 | | |
| Sample Packing List | | | | | |
| | 2 | (Blacked out) | 100 | | |
| | 6 | (Blacked out) | 100 | | |
| | 2 | EWP Discharge Tubes | 150 | | |
| | 1 | Assembly Parts Box as listed below: | 100 | | |
| | 17 | Wash Press and Trough Leg Wedge Anchors | 1/2" x 5 1/2" | | |
| | 8 | Support Stand, Valve Stand Wedge Anchors | 3/8" x 3 3/4" | | |
| | 2 | PVC Elbows for Drain Pan | | | |
| | 32 | Discharge Tube and Trough Flange Bolts w/ nylock nuts | 1/2" x 1 1/2" | | |
| | 16 | Hose Clamps "Stainless Steel" | 1/2" | | |
| | 50' | Clear Braided Valve Hose. | 3/4" x 1/2" | | |
| | 6 | EWP Discharge Tube and Trough Flange Gaskets. | | | |
| | 12 | Trough Leg Attachment Bolts w/ Nylock Nuts | 3/8" x 1 1/4" | | |
| | 1 | Spare Parts Box as listed below: | 450 | | |
| | 1 | Complete Replacement Bearings Sets for the Drive Motor | | | |
| | 2 | Replacement Spiral Brushes | | | |
| | 1 | Replacement Screw | | | |
| | 1 | Replacement Thrust Bearing | | | |
| | | 1 year of lubricant | | | |
| CRATE TOTAL | | CHECKED BY HSW | ORDER COMPLETE YES | BALANCE TO FOLLOW NONE | TOTAL WEIGHT 3525 |

Receiving and Storage: Long Term Storage

Upon receipt of the shipment, carefully check the contents of the delivery against the packing list to insure that the delivery is complete, and all components are accounted for. No claims for missing components will be honored if not identified at the time of receipt of the shipment.

If at all possible, the equipment should be stored inside, in a climate controlled environment.

The major pieces of equipment are shipped on skids or pallets. Do not remove the equipment from the shipping skids or pallets, except as required to inspect the components, and check the scope of supply. Inventory all loose items identified on the packing list.

The skids must be placed on a smooth, level surface. If outside, suitable cribbing must be arranged to support the skids and their associated weight.

The equipment should be tarped to protect it from moisture, dust, or other harmful elements.

If the equipment is to be stored outside for more than one month, the following “lay up” procedures must be followed:

- Drain gear cases completely, and refill completely full with a compatible gear oil. Lubrication recommendations may be found in Section 5 of the Operation and Maintenance manual. The gear is normally shipped with a plug installed in the breather port. Make sure that the plug is installed, and not the breather. Tag the gear “Check oil level before operating”.
- The electric motor, and all exposed electrical components should be sealed in heavy duty plastic bags with a suitable number of desiccant packs placed in the bags. The storage period and the volume of the bag determine the number of bags.

After lay up, and before installing the equipment, the following procedures must be followed:

- Unbag all electrical components and inspect for corrosion.
- The equipment should be washed down completely, and thoroughly dried. Inspect for any signs of corrosion.
- Drain the gear cases down to the normal fill level. (note: some equipment may need to be installed prior to performing this step)
- Follow all lubrication instructions, as outlined in section 5 of the Operation and Maintenance manual.

Follow the normal installation procedures as outlined in Section 4 of the Operation and Maintenance manual.

Vulcan Shaftless Screw Conveyor

Section 4

Installation & Start-Up Instructions

4.1 Installation: Mechanical

Important! Vulcan Industries uses all stainless steel hardware and anchor bolts for the assembly and anchoring of the equipment. Vulcan strongly recommends the use of an anti-seize lubricant specifically formulated for use with stainless steel on assembly hardware. Unlubricated hardware has a tendency to seize, and cannot be properly tightened. Seized bolts must be replaced.

Bolt Torque:

| | |
|-------------|-------------------|
| 3/8" | 15 Ft. Lb. |
| 1/2" | 35 Ft. Lb. |
| 5/8" | 50 Ft. Lb. |
| 3/4" | 80 Ft. Lb. |

STANDARD ERECTING PRACTICES

All fabricated equipment manufactured by Vulcan Industries is shop assembled and tested prior to shipping, and should not present any abnormal erection problems. Due to varying field conditions, a reasonable amount of fit-up is considered standard erection practice. The use of such tools as “come-a-longs”, jacks, drifts, and reamers is to be expected. The equipment should be assembled and installed according to the AISC “Code of Standard Practice”. Section 7.12 of that code states:

“Normal erection operations include the correction of minor misfits by moderate amounts of reaming, chipping, welding, or cutting, and the drawing of elements into line through the use of drift pins. Errors which cannot be corrected by the foregoing means or which require major changes in member configuration are reported immediately to the owner and fabricator by the erector, to enable whoever is responsible either to correct the error or to approve the most efficient and economic means of correction to be used by others.”

If an erection problem is traceable to Vulcan Industries fabrication or engineering departments, we will work to resolve the problem. If field modifications are done by others to correct the problem, they must be approved, in writing, by Vulcan Industries Inc. No back charges will be accepted by Vulcan Industries unless the deficiencies are documented, and the remedy is approved in writing by Vulcan Industries.

The conveyor is shipped with the support legs unattached. Begin by inspecting the area where the conveyor is to be located. The area must be cleared of any construction debris. The points of anchor should be checked for flatness and level. Slight deviations (+ or – 3/4”) can be shimmed out at the support feet. Gross deviations (over 3/4”) must be corrected before installation is begun.

Support legs are match marked for their respective locations. Identify marks, and lay out support legs at their respective locations. Using proper lifting techniques (refer to receiving instructions) raise the conveyor to its final position (see setting plan drawings, or work from approved shop drawings) and install support legs with hardware provided. Do not install anchors to the floor at this time.

Install all additional appurtenances such as inlet hoppers, discharge chutes, covers, etc. as shown on the General Arrangement drawings.

CRITICAL TO INSTALLATION!

Check the conveyor trough for straightness and for absence of twist. This can be accomplished using a laser level or other instruments as required to establish that the trough is straight within ½” over its entire length, and twisted less than 2° over the entire length. Adjust or shim support legs as required. The anchors may now be installed. Refer to the shop drawings for location, size, and type of anchor. Follow anchor manufacturer’s instructions for anchoring.

4.2 Installation: Electrical

Electrical interconnection must be performed by qualified, licensed professional electricians. The interconnections required are documented in the Electrical section of the shop drawings. The electrical contractor should thoroughly familiarize himself with this section and identify all interconnection points before beginning work. Any questions regarding the work should first be directed to the General Contractor.

It is the electrician’s responsibility to check the gearmotor for proper rotation. This may be done **ONLY** after all connections have been made, all safety devices are installed and have been verified as functional, and the conveyor has been cleared of any construction or installation debris. The rotation of the gearmotor is correct when the spiral, while turning, advances from the inlet toward the discharge. “Bump” the motor briefly to verify rotation. After verification, the electrician should attach a tag to the gearmotor confirming rotation verification. The tag should be signed and dated.

4.3 Start Up, Operation

1: Precautions:

Prior to initial startup of the equipment, verify the following:

- Check that equipment is anchored securely at all points
- Check all assembly bolts for tightness
- Check the gearmotor for proper lubrication level and venting (see section on gearmotor for lube type, quantity, and fill/drain locations)
- Check any piping connections for leakage

- ❑ Verify that all electrical connections have been made, gearmotor has been checked for proper rotation, and all electrical safety devices are installed, connected, and operating
- ❑ Check that no construction debris, tools, or other matter is in the conveying zone (spiral)
- ❑ Install all protective covers and fasteners

2: Trial Run:

Start the conveyor in hand mode, forward. Immediately verify that the motor rotation is correct by observing the direction of the spiral. The rotation is correct when the spiral appears to move toward the discharge end. Next, observe the spiral for smooth operation. There should be no signs of binding or vibration evident while the spiral is turning. If all is well, run the conveyor for about ten min. and check for hot spots or noisy operation. Conveyor may now be put into service.

3: Normal Operation:

Under normal operation the conveyor will generally be controlled by sequencing with upstream and downstream devices. Make sure all such devices are functional before selecting “auto” mode. Operators must be made aware of the fact that the equipment is remotely controlled and may start at any time. Equipment should never be operated with protective covers removed or safety devices in operative.

Vulcan Shaftless Screw Conveyor

Section 5

Maintenance Instructions & Lubrication Charts

TF Screw Conveyor Troubleshooting Guide

| PROBLEM | POSSIBLE CAUSE | SOLUTION |
|---|--|--|
| Machine won't start, motor not running | <ul style="list-style-type: none"> ▪ Loss of Power ▪ Emergency Stop(s) engaged | <ul style="list-style-type: none"> ▪ Check incoming power to control panel ▪ Check for control power (110 V.A.C.) out of control power transformer ▪ Check Fuses, disconnects ▪ Check overload devices, safety switches, reset as required |
| Power available, machine won't start in "Auto", motor not running | No signal to main control panel | <ul style="list-style-type: none"> ▪ Try "Hand" operation. If machine operates in "Hand", check <u>start signal</u> input devices. |
| Power available, machine won't start in "Hand", motor not running | Emergency Stop(s) engaged Motor Bad | <ul style="list-style-type: none"> ▪ Check E-stop device(s) ▪ Check and Replace Motor |
| Power available, machine won't start in "Hand", motor running | Breakdown in Power Transmission | <ul style="list-style-type: none"> ▪ Check drive components; isolate faulty component and repair/replace as required. |
| Conveyor has excessive noise while running | Gear reducer failure | <ul style="list-style-type: none"> • Replace or repair gear reducer |
| | Trough liner wear | <ul style="list-style-type: none"> • Check trough liner for worn or thin areas, replace as required |
| | Bent spiral | <ul style="list-style-type: none"> • Check spiral for smooth, flat operation in trough. A bent spiral will require straightening or replacing. |
| | Solid obstruction | <ul style="list-style-type: none"> • Remove objects causing obstruction |
| | | |
| | | |

5.1: Maintenance:

The maintenance requirements of the spiral screw conveyor are minimal, because of the small number of moving parts. The gear motor should be maintained according to recommendations in the section “Drive System Components”. The wearing parts (liner and spiral) should be checked for evidence of abrasion or wear monthly. To inspect, the covers must be removed. Before **ANY** maintenance is performed, be sure to follow all local lock out – tag out procedures to isolate the equipment from power sources.

Remember: Equipment is automatic and may start at any time if not locked out!

The following procedure should be followed for inspecting the spiral and the liner:

- ⇒ Stop material feed from upstream devices
- ⇒ Run the conveyor in manual until all the materials have been discharged
- ⇒ Flush the conveyor trough with clean water
- ⇒ Stop and lock out the conveyor
- ⇒ Now the covers may be removed. Additional flushing may be necessary.
- ⇒ Replace ALL covers before re-starting the machine.

5.2 Removing and installing the spiral, drive motor, and gear unit

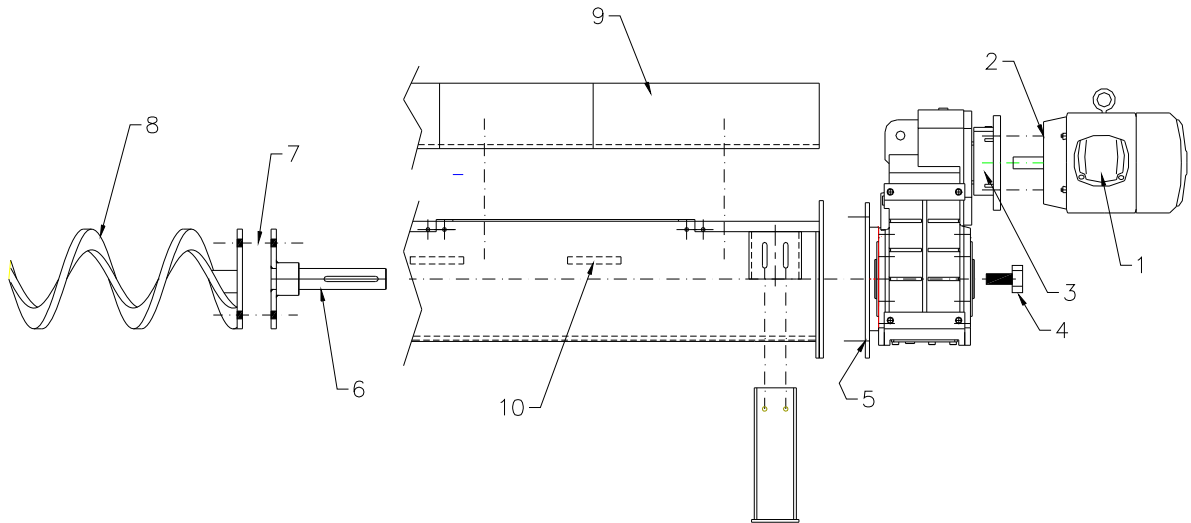


Figure 1

The following must be observed before removing any of the components:

Refer to Section 1: General safety instructions for necessary safety procedures. **Remember. The equipment is controlled automatically, and may start at any time. Follow your local “Lock Out Tag Out” procedures to ensure power is disconnected from equipment before proceeding.**

Remove all covers, wash components thoroughly with clean water. If necessary, disinfect all components.

To remove the motor:

1. Open electrical connection box at motor (1) and disconnect power leads. Refer to electrical schematic, and record connections, for future reconnection. Secure loose ends of wires with wire nuts or other type of insulators. Close the electrical connection box (1).
2. Loosen (two) setscrews inside the K5TC motor adaptor (3).
3. Remove four bolts (2) at the gear motor flange and remove the motor. Note that the motor shaft must slide out of the reducer quill. **Caution! Motor is heavy.** Use appropriate lifting straps and devices.

To remove the gear reducer:

1. Remove the bolt (4) and washer from the drive shaft (6)
2. Remove the flange bolts (5) from the gear reducer and conveyor trough end flange.
3. Use an appropriate puller to press the gear reducer off the drive shaft (6).
Caution! Gear is **heavy**. Use appropriate lifting straps and devices.

To remove the spiral:

1. Remove the attaching bolts (7) from the spiral (8) and the drive shaft (6). The spiral may then be lifted vertically out of the trough, or slid horizontally out of the trough. Support the spiral at 6-foot intervals minimum, to prevent the spiral from bending.
2. Check the spiral for wear and abrasion. The outside diameter of the spiral should be within 12 mm. of the nominal spiral diameter (i.e., TF 280 = 280mm). Check the spiral for kinks or bends. This can be checked by rolling the spiral on a flat surface. If wear or bending is evident, replace spiral.

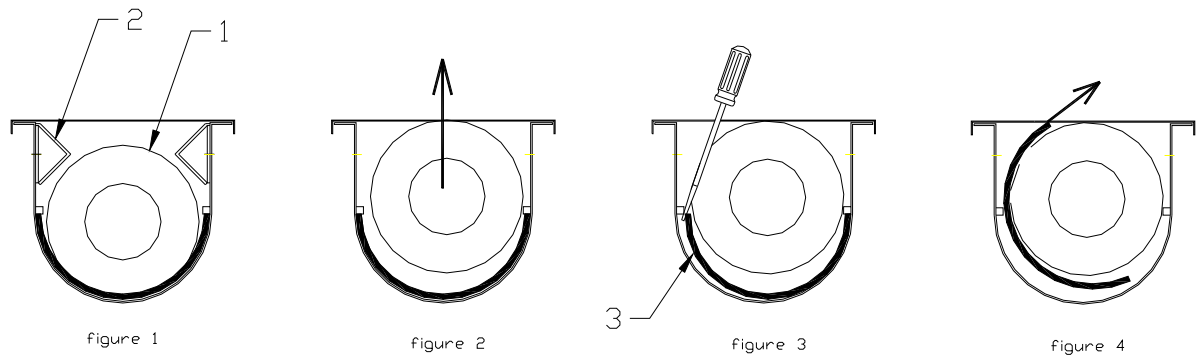
Replace parts in the reverse order of disassembly.

Before returning the equipment to service check the following:

1. Open the electrical connection box at the motor (1) and reconnect all leads. (Refer to wiring diagram and notations made at disassembly.)
2. Set the operating switch at the main control panel to “local – manual”. **Make sure that the machine cannot be switched on automatically.** “Bump” the motor “Forward” to check rotation of the spiral. The spiral should rotate clockwise looking from the back to the front, and appear to advance to the discharge end. If not, make appropriate connection changes.
3. Run the conveyor in forward a few turns to check for unobstructed rotation. The spiral should run smoothly in the trough with no unusual bumping or grinding.
4. Lock power back out, then replace all protective covers, guards, and safety devices. Check all safety devices for proper operation. The equipment may now be put back into service.

5.3 Replacing the Trough Liners

The trough liners are supplied in sections approximately four feet long. The sections are banded to help them retain their curved shape. The bands should be left on until the section is installed.



To replace the liner sections,

- Fig. 1. Remove the spiral hold down angles (2)
- Fig. 2. Lift and support the spiral off the liner. The spiral should be supported at a minimum of 6 foot intervals.
- Fig. 3. Pry the liner out from the liner hold down tab.
- Fig. 4. Rotate the liner around the spiral and out of the trough.

Roll new liner sections into position, making sure that liner is completely secured by the hold down tabs.

Reassemble trough components.

5.4 Lubrication Table

The ambient operating temperature should always be considered when selecting lubricants. The lubrication chart shows the recommended lubrication for various components operating at 70 Deg. F. ambient temperatures. This listing does not show an order of preference.

Never mix mineral oils with synthetic oils.

Never overfill gear reducers. Premature seal failure and leakage will result from overfilling.

Lubrication Schedule:

| Maintenance Operation | Frequency | Lubricant (if Applicable) | Comments |
|---|---|---------------------------|-----------------------|
| Check gear reducer oil level, Check quality of gear oil | Half-Yearly (or every 600 Operating Hours) | Gear Oil | Reference: 6 of O & M |

| Reference Symbol | Mobil | Shell | Castrol | Allied | Or Equal |
|--|-------------------|-----------|--------------|-----------------|----------------------|
| Gear Oil | Mobilgear XMP 220 | Omala 220 | Alpha SP 220 | Gear Lube 75W90 | BP Energol GR-XP 220 |
| Reference: Section 6 of O & M "Maintenance Instructions & Lubrication Charts" | | | | | |

Note: Equipment is shipped with Shell Omala 220 gear lube.

Notes

Vulcan Shaftless Screw Conveyor

Section 6

Drive System Components & Replaceable Parts

VULCAN INDUSTRIES, INC.

| | | |
|----------------------|-------------|---|
| Device 1 | | Quality Control Document |
| Job No. | 19177 | Form #: 4.4.11 |
| Job Name | Wichita KS. | Date of test: 1/3/2020 |
| Equipment Type | TF - 240 | |
| Equipment Serial No. | 19177-450-7 | |
| Tagged AWG-1 | | Description of test: In Shop Factory Test |

| Motor Nameplate Data | | | | |
|----------------------|-----------------|------|---------------|-------|
| Mfg. | Baldor-Reliance | | | |
| Serial No. | F1908272869 | | | |
| CAT No. | | | | |
| Spec. # | 05F831W649G1 | | | |
| No. | D61008958 | | | |
| Frame | Type | Code | Design | Class |
| 145TC | C1/D1 | J | B | F |
| Encl. | H.P. | PH. | HZ | RPM |
| | 2 | 3 | 60 | 1725 |
| S.F. | VOLTS | | AMPS | |
| 1.15 | 208 - 230 / 460 | | 5.7-5.4 / 2.7 | |
| DE brg | 6205 | | | |
| ODE brg | 6203 | | | |

| Reducer Nameplate Data | |
|------------------------|---------------------|
| Mfg. | Siemens |
| Serial No. | FDU1909/2500868 001 |
| Type | KAZ89-K5-(140) |
| Mount | M4-A |
| Oil Capacity | 6.8 liter |
| T ₂ = | 1054 Nm |
| N ₂ = | |
| I (ratio) = | 129.96 |
| SF | |

| Brake Nameplate Data | |
|----------------------|--|
| Mfg. | |
| Serial No. | |
| Model No. | |
| Ft lbs torque | |
| Voltage | |

| Test Remarks | | | |
|----------------------------------|-----|-----|--|
| Reducer vent plug installed | Y | N | |
| Oil level confirmed | Y | N | |
| All lubrication completed | Y | N | |
| Adjustment required | Y | N | |
| Operated with designed controls | Y | N | |
| Video taped operation | Y | N | |
| Control panel verified | Y | N | |
| 8 hr run test completed | Y | N | |
| Screen hour meter start / finish | 0.5 | 8.7 | |

| Testing Equipment: | | |
|-----------------------|------------|---------------------|
| Test Device 1: | Serial No. | Date of Calibration |
| Fluke 333 Clamp Meter | 79610273 | 7/24/2020 |
| Test Device 2: | Serial No. | Date of Calibration |
| Fluke 65 Thermometer | 95600311 | 7/13/2020 |

| Voltage Reading Phase to Phase: | | | | |
|---------------------------------|-------|-------|------------------|--------------------|
| L1-L2 | L1-L3 | L2-L3 | Motor Temp. Rise | Reducer Temp. Rise |
| 482 | 474 | 489 | 65 | 64 |
| | | | at start up | |
| Motor Amp Reading | | | 72 | 15 min. |
| T1 | T2 | T3 | 75 | 30 min |
| 1.2 | 1.5 | 1.5 | 81 | 1 hr. |
| | | | 82 | 2 hr. |
| | | | 82 | 3 hr. |
| | | | 83 | 4 hr. |
| | | | 82 | 5 hr. |
| | | | 82 | 6 hr. |
| | | | 83 | 7 hr. |
| | | | 83 | 8 hr. |

| TEST REMARKS: |
|---|
| <p>Went over control panel operation with technician, verifying complete operation.</p> <p>Connected control panel to equipment and verified operation between the two pieces of equipment</p> <p>Ran equipment for period of 8 hours monitoring amps, voltage, and temperature of both motor and gear box.</p> |

VULCAN INDUSTRIES, INC.

| | | |
|----------------------|-------------|---|
| Device 1 | | Quality Control Document |
| Job No. | 19177 | Form #: 4.4.11 |
| Job Name | Wichita KS. | Date of test: 1/21/2020 |
| Equipment Type | TF - 240 | |
| Equipment Serial No. | 19177-450-8 | |
| Tagged AWG-2 | | Description of test: In Shop Factory Test |

| Motor Nameplate Data | | | | |
|----------------------|-----------------|------|---------------|-------|
| Mfg. | Baldor-Reliance | | | |
| Serial No. | F1908272864 | | | |
| CAT No. | | | | |
| Spec. # | 05F831W649G1 | | | |
| No. | D61008957 | | | |
| Frame | Type | Code | Design | Class |
| 145TC | C1/D1 | J | B | F |
| Encl. | H.P. | PH. | HZ | RPM |
| | 2 | 3 | 60 | 1725 |
| S.F. | VOLTS | | AMPS | |
| 1.15 | 208 - 230 / 460 | | 5.7-5.4 / 2.7 | |
| DE brg | 6205 | | | |
| ODE brg | 6203 | | | |

| Reducer Nameplate Data | |
|------------------------|---------------------|
| Mfg. | Siemens |
| Serial No. | FDU1909/2500868 002 |
| Type | KAZ89-K5-(140) |
| Mount | M4-A |
| Oil Capacity | 6.8 liter |
| T ₂ = | 1054 Nm |
| N ₂ = | |
| I (ratio) = | 129.96 |
| SF | |

| Brake Nameplate Data | |
|----------------------|--|
| Mfg. | |
| Serial No. | |
| Model No. | |
| Ft lbs torque | |
| Voltage | |

| Test Remarks | | | |
|----------------------------------|-----|---|--|
| Reducer vent plug installed | Y | N | |
| Oil level confirmed | Y | N | |
| All lubrication completed | Y | N | |
| Adjustment required | Y | N | |
| Operated with designed controls | Y | N | |
| Video taped operation | Y | N | |
| Control panel verified | Y | N | |
| 8 hr run test completed | Y | N | |
| Screen hour meter start / finish | 0.8 | 9 | |

| Testing Equipment: | | |
|-----------------------|------------|---------------------|
| Test Device 1: | Serial No. | Date of Calibration |
| Fluke 333 Clamp Meter | 79610273 | 7/24/2020 |
| Test Device 2: | Serial No. | Date of Calibration |
| Fluke 65 Thermometer | 95600311 | 7/13/2020 |

| Voltage Reading Phase to Phase: | | | | |
|---------------------------------|-------|-------|------------------|--------------------|
| L1-L2 | L1-L3 | L2-L3 | Motor Temp. Rise | Reducer Temp. Rise |
| 474 | 485 | 487 | 65 | 64 |
| | | | at start up | |
| Motor Amp Reading | | | 76 | 15 min. |
| T1 | T2 | T3 | 79 | 30 min |
| 1.4 | 1.4 | 1.5 | 82 | 1 hr. |
| | | | 85 | 2 hr. |
| | | | 84 | 3 hr. |
| | | | 85 | 4 hr. |
| | | | 83 | 5 hr. |
| | | | 83 | 6 hr. |
| | | | 83 | 7 hr. |
| | | | 85 | 8 hr. |

| TEST REMARKS: |
|---|
| <p>Went over control panel operation with technician, verifying complete operation.</p> <p>Connected control panel to equipment and verified operation between the two pieces of equipment</p> <p>Ran equipment for period of 8 hours monitoring amps, voltage, and temperature of both motor and gear box.</p> |

BALDOR® • RELIANCE

Product Information Packet

DXP INDUSTRIES

05F831W649G1

2HP,1725 65C RISERPM,3PH,60HZ,145TC,0532

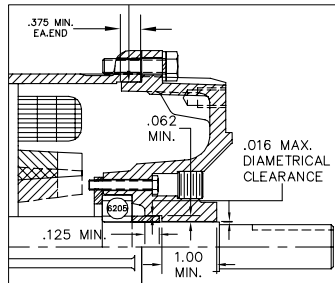
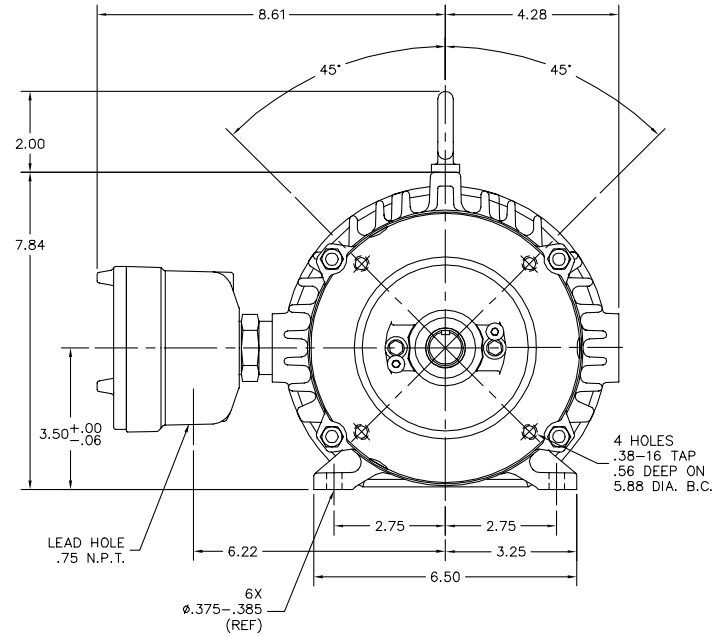
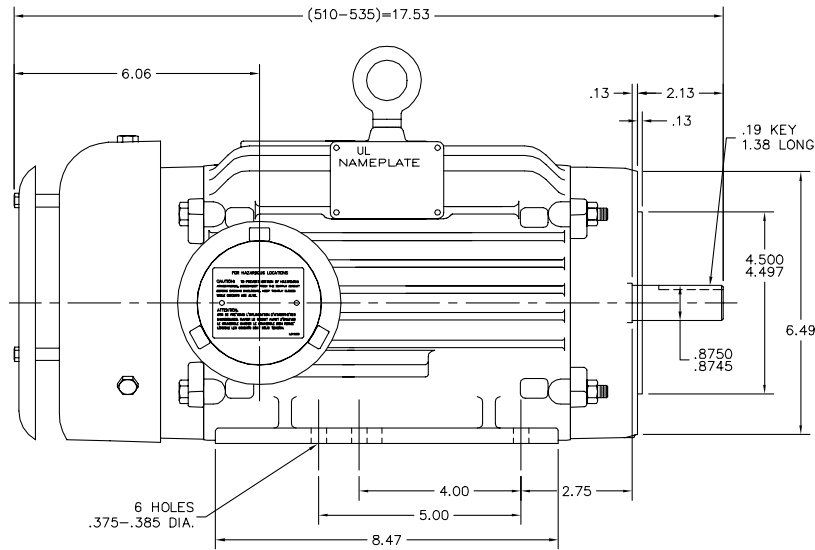
| Part Detail | | | | | | | |
|-------------|-------|-------------|-------|----------------|----------|---------------|------------|
| Revision: | - | Status: | PRD/A | Change #: | | Proprietary: | No |
| Type: | AC | Prod. Type: | 0532M | Elec. Spec: | 05WGW649 | CD Diagram: | |
| Enclosure: | XPFC | Mfg Plant: | | Mech. Spec: | 05F831 | Layout: | |
| Frame: | 145TC | Mounting: | F1 | Poles: | 04 | Created Date: | 06-20-2012 |
| Base: | RG | Rotation: | R | Insulation: | F | Eff. Date: | 07-12-2012 |
| Leads: | 9#18 | Literature: | | Elec. Diagram: | | Replaced By: | |

| Nameplate NP0977XP | | | | | | | |
|--------------------|---------------|--------------|------------|------|---|-------|-------|
| NO. | | TEMP CODE | T3C | | | | |
| SPEC. | 05F831W649G1 | DE BRG | 6205 | | | | |
| CAT.NO. | | ODE BRG | 6203 | | | | |
| HP | 2 | GREASE | POLYREX EM | | | | |
| VOLTS | 208-230/460 | MOTOR WEIGHT | 80 LBS | | | | |
| AMPS | 5.7-5.4/2.7 | NEMA-NOM-EFF | 86.5 | | | | |
| RPM | 1725 65C RISE | FL PF | 82 | | | | |
| CYCLE | 60 | PH | 3 | CL | F | FRAME | 145TC |
| SER.F. | 1.15 | DES | B | CODE | J | CC | 010A |
| SER. | | | | | | | |
| RATING | 50C AMB-CONT | | | | | | |
| USABLE AT 208V | | | | | | | |

| Parts List | | |
|-------------|--|----------|
| Part Number | Description | Quantity |
| SA247364 | SA 05F831W649G1 | 1.000 EA |
| RA234238 | RA 05F831W649G1 | 1.000 EA |
| HW3201A05 | 3/8-16 EYEBOLT | 1.000 EA |
| HW4002A18 | 1"HEX STEEL PIPE NIPPLE FOR 305XP MTRS | 1.000 EA |
| HW3021F12 | SPRING PIN, .156 X 1.25 | 1.000 EA |
| 35CB1005A01 | CONDUIT BOX,MACH - GROUP "C" MTRS | 1.000 EA |
| 35EP1715A02 | FR ENDPLATE,TEFC,35M,X-PROOF MTR,GROUP"C | 1.000 EA |
| 84XN3118J20 | 5/16-18 X 1 1/4" SOC HD CAP SCREW | 4.000 EA |
| HW5100A03SP | WAVY WASHER (W1543-017) | 1.000 EA |
| 35EP1704A11 | PU ENDPLATE, MACH GROUP "C" | 1.000 EA |
| 84XN3118J20 | 5/16-18 X 1 1/4" SOC HD CAP SCREW | 4.000 EA |
| 51XN1032A20 | 10-32 X 1 1/4 HX WS SL SR | 2.000 EA |
| HW4001A01 | 1/4 HX SOC PIPE PLG (F/S) ALLOY STEEL W/ | 2.000 EA |
| 60XN1032A07 | 10-32 X 1/2 TRUSS HEAD, TORX SERRATED ZN | 2.000 EA |
| 51XB1214A16 | 12-14X1.00 HXWSSLD SERTYB | 1.000 EA |
| 35FH1000A18 | FAN COVER FOR DRIP COVER | 1.000 EA |
| 10XN2520A18 | 1/4-20 X 1-1/8 HEX CAP SCREW. | 3.000 EA |
| 35FH4500A11 | DRIPCOVER(W/ AUTOPHERETIC PRIMER) | 1.000 EA |
| HA2001A13 | 35-10103 SPACER WELKER | 3.000 EA |
| 51XN1032A20 | 10-32 X 1 1/4 HX WS SL SR | 3.000 EA |
| 35CB1501A01 | CONDUIT BOX LID, MACH. - GROUP "C"MTRS | 1.000 EA |
| RM1020A41 | O-RING, -150 BUNA-N, .103 CS X 2.862 ID | 1.000 EA |
| HW2501D13SP | KEY, 3/16 SQ X 1.375 | 1.000 EA |
| HA7000A01 | KEY RETAINER 7/8" DIA SHAFT | 1.000 EA |

| Parts List (continued) | | |
|------------------------|--|----------|
| Part Number | Description | Quantity |
| 85XU0407S04 | 4X1/4 U DRIVE PIN STAINLESS | 6.000 EA |
| LB1115 | LABEL,LIFTING DEVICE | 1.000 EA |
| LB1359 | LABEL, UL/CSA "XP" | 1.000 EA |
| MJ1000A75 | GREASE, POLYREX EM EXXON | 0.050 LB |
| 35FN3002A05SP | EXFN, PLASTIC, 6.376 OD, .638 ID | 1.000 EA |
| MG1025Z20 | ACTIVATOR WILKOFAS 060.32 | 0.010 GA |
| MG1025G29 | PAINT 789.205 DARK GRAY METALLIC (USE W/ | 0.017 GA |
| LB1119 | WARNING LABEL | 1.000 EA |
| LB1172A01 | CUSTOM MTR CARTON LABEL LASER PRINTER | 1.000 EA |
| LC0145B01 | CONNECTION LABEL | 1.000 EA |
| NP0977XP | BR XP UL CSA CC CL-I GP-C&D | 1.000 EA |
| 36PA1001 | PACKAGING GROUP | 1.000 EA |

05LYF831



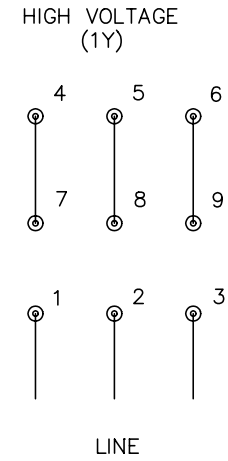
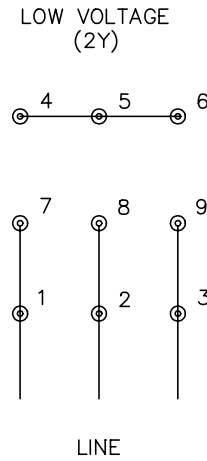
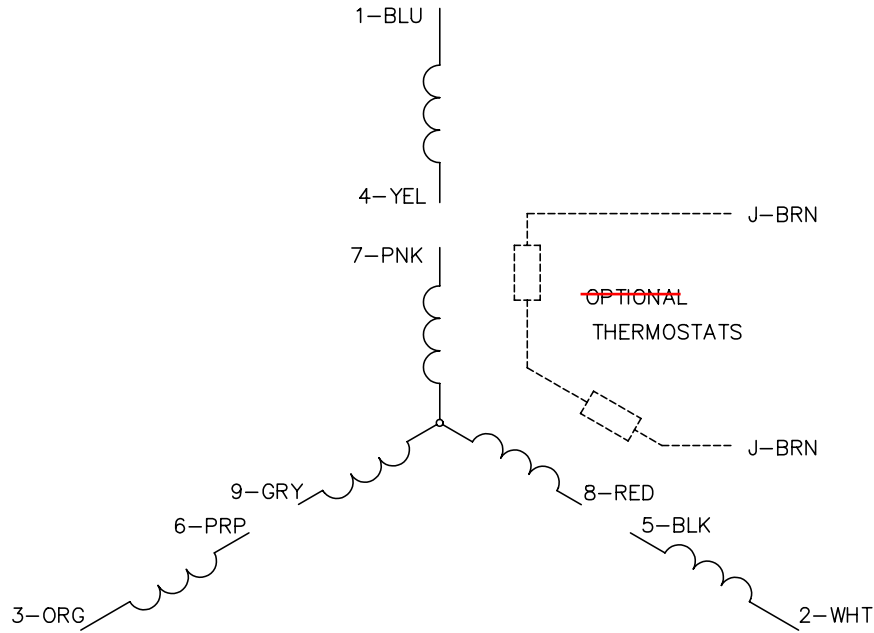
CUSTOMER IS RESPONSIBLE FOR DETERMINING THAT BALDOR'S PRODUCT WILL PERFORM SUITABLY IN THE INTENDED APPLICATION.

| | | |
|----------------------|------------------------------|-------------------|
| REV. DESC: NEW | VERSION: 00 | TDR: 000000752108 |
| REV. LTR: - | REVISED: 01:43:59 06/20/2012 | BY: ENALEMO |
| FILE: \AAA\00192\650 | | |
| MTL: - | | |

BALDOR
 HOR 143-5TC XPFC X35M CLI GP C&D W/DRIP COVER
 SH 1 of 1

05LYF831

CD0005



NOTES:

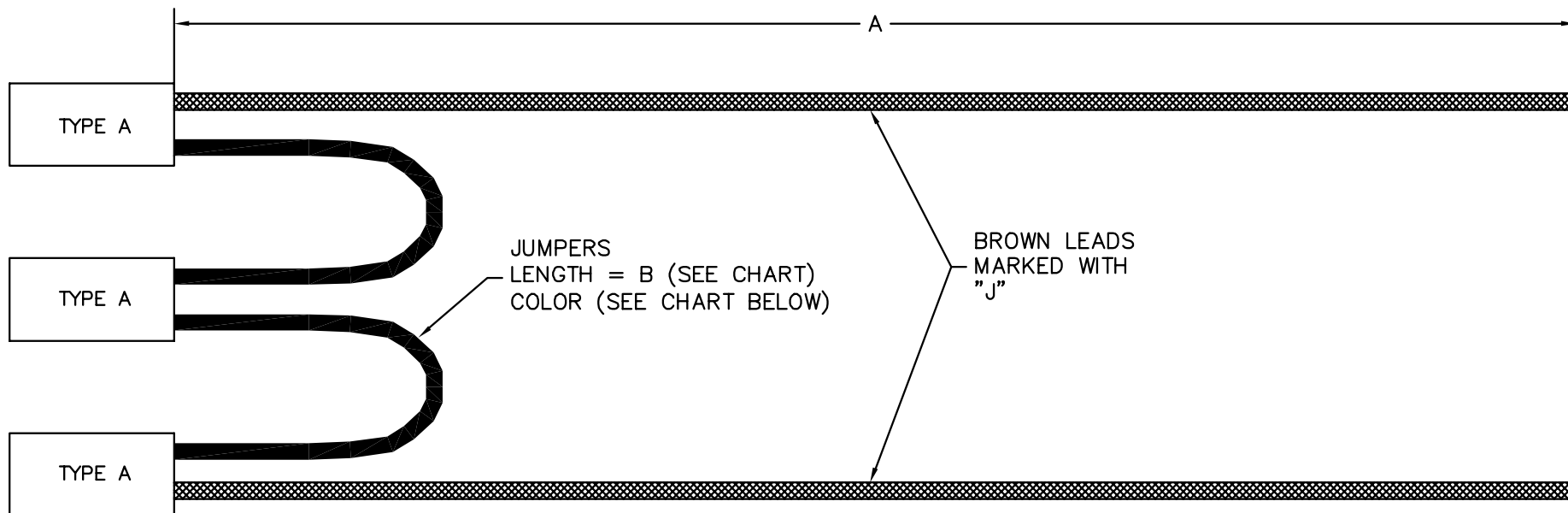
1. INTERCHANGE ANY TWO LINE LEADS TO REVERSE ROTATION.
2. ~~OPTIONAL~~ THERMOSTATS ARE PROVIDED WHEN SPECIFIED.
3. ACTUAL NUMBER OF INTERNAL PARALLEL CIRCUITS MAY BE A MULTIPLE OF THOSE SHOWN ABOVE.
4. LEAD COLORS ARE OPTIONAL. LEADS MUST ALWAYS BE NUMBERED AS SHOWN.

| | | | |
|---|---------|-------------------------|--------------|
| REV. DESC: REVISE TO SHOW OPTIONAL COLORS | | | |
| REV. LTR: E | BY: JLP | REVISED: 01/19/99 10:15 | TDR: 0171435 |
| 900000 | | FILE: AAA00005140 | MDL: - |
| | | MTL: - | |

BALDOR ELECTRIC Co.

3PH, DV, 9 LEADS

CD0005



| PART# SUFFIX | TEMPERATURE | JUMPER LEAD COLOR | SLEEVE MATERIAL | TI PART# | A | B | BALDOR MODEL |
|--------------|-------------|-------------------|-----------------|----------|--------|-------|---------------------------|
| A01 | 135°C | YELLOW | .006" MYLAR | 7AM034A5 | 28.00" | 5.00" | 35, 36, 37, 305, 306, 307 |
| A02 | 150°C | BLACK | .006" MYLAR | 7AM037A5 | 28.00" | 5.00" | 35, 36, 37, 305, 306, 307 |
| A03 | 110°C | WHITE | .006" MYLAR | 7AM029A5 | 28.00" | 5.00" | 35, 36, 37, 305, 306, 307 |

NOTES:

1. THERMOSATS: TI 7AMxxx DEVICES, NUMBER, AND TEMPERATURE SPECIFIED BY ASSEMBLY
2. ALL LEADS TO BE 18 GAGE, 150°C, 600V, XLPE
3. THERMOSTATS TO BE MARKED WITH TI PART NUMBER AND OPENING TEMPERATURE.
4. ALL LEADS TO BE UL RECOGNIZED
5. ALL LEADS TO BE CSA CERTIFIED, OR UL RECOGNIZED FOR CANADA

REV. DESC: REVISED NOTES TO MATCH UL REQUIREMENTS

| | | |
|----------------------|-------------------------------|-------------------|
| REV. LTR: B | VERSION: 02 | TDR: 000000465431 |
| FILE: \AAA\00106\872 | REVISED: 10: 58:16 05/19/2008 | |
| MTL: - | BY: ENBRAMO | |

BALDOR • DODGE • RELIANCE

3 THERMOSTAT ASSEMBLY DRAWING

SH 1 of 1



AC Induction Motor Performance Data

Record # 40516

Typical performance - not guaranteed values

| | | |
|--------------------------|--------------------|------------------------|
| Winding: 05WGW649 | Type: 0532M | Enclosure: XPFC |
|--------------------------|--------------------|------------------------|

| Nameplate Data | | | | General Characteristics at 460 V, 60 Hz: High Volt Connection | |
|-------------------|--------------|----------|----|--|------------|
| Rated Output (HP) | 2 | | | Full Load Torque | 6 LB-FT |
| Volts | 208-230/460 | | | Start Configuration | DOL |
| Full Load Amps | 5.7-5.4/2.7 | | | Break Down Torque | 21 LB-FT |
| R.P.M. | 1725 | | | Pull-Up Torque | 14.9 LB-FT |
| Hz | 60 | Phase | 3 | Locked-rotor Torque | 17 LB-FT |
| NEMA Design Code | B | KVA Code | J | Starting Current | 20.8 Amps |
| Service Factor | 1.15 | | | No-load Current | 1.15 Amps |
| NEMA Nom. Eff. | 86.5 | P.F. | 82 | Line-line Res. @ 25°C. | 8.18 Ohms |
| Rating - Duty | 50C AMB-CONT | | | Temp. Rise @ Rated Load | 37°C |
| S.F. Amps | | | | Temp. Rise @ S.F. Load | 46°C |

Load Characteristics at 460 Volts, 60 Hz

| % of Rated Load | 25 | 50 | 75 | 100 | 125 | 150 | S.F. |
|-----------------|------|------|------|------|------|------|------|
| Power Factor | 44 | 67 | 77 | 82 | 83 | 84 | 83 |
| Efficiency | 82.3 | 87.3 | 88.2 | 87.5 | 86 | 84 | 86.6 |
| Speed | 1783 | 1768 | 1751 | 1733 | 1712 | 1689 | 1720 |
| Line Amperes | 1.32 | 1.62 | 2.07 | 2.59 | 3.19 | 3.86 | 2.95 |

Baldor Electric Company Fort Smith, Arkansas





0.19.65

Datasheet for SIMOGEAR Geared Motors
MLFB-Ordering data: **2KJ3510-5BA05-0HD2-Z**
D14+K06+K41+L03+L50+Y00

{Y00:*AND@1755*|*ANL@1.49*}

Client order no.:
Order no.:
Offer no.:

Item no.:
Consignment no.:
Project:

Geared motor basic data

| | |
|----------------------------------|----------------------------------|
| Type designation: | SIMOGEAR KAZ89-K5-(140) |
| Gearbox type: | Bevel gearbox |
| Installation size(s): | 89 |
| Application: | Standard |
| Light-duty sector acc. VDI 3643: | - |
| Transmission ratio: | 129.96 |
| Relation of number of teeth: | 17155 // 132 |
| Service factor: | - |
| Nominal torque: | 1600 Nm |
| Output torque: | - |
| Output speed: | - |
| Environment temperature: | -15 ... +40°C |
| Specification: | CE (Europe / other countries) |
| Oil quantity: | 6.80 l |
| Weight without oil: | 57.0 kg |
| Adapter: | K5 Short adapter for NEMA motors |
| Permissible input torque: | 13 Nm |

Adapter options

| | |
|------------------------------------|---|
| Backstop: | - |
| Condensation drain hole: | - |
| Input Shaft w/o Feather Key: | - |
| Rotation output shaft: | - |
| Slip clutch with proximity switch: | - |
| Slip torque is set: | - |
| Rotating direction: | - |

General options

| | |
|------------------------------------|---|
| Surface treatments: | Painted |
| Coating: | [L03] Coating for low environmental stress C2 |
| RAL Color: | [L50] 5015 sky blue |
| Pretreatment: | - |
| Coating on Flange: | - |
| Conservation: | - |
| Rating Plate stainless steel: | - |
| Second rating plate: | [K41] second rating plate supplied loose |
| Packaging: | Standard packing |
| Fast lane: | - |
| Enclosed documentation: | - |
| Additional documentation (E-Mail): | - |

Gearbox options

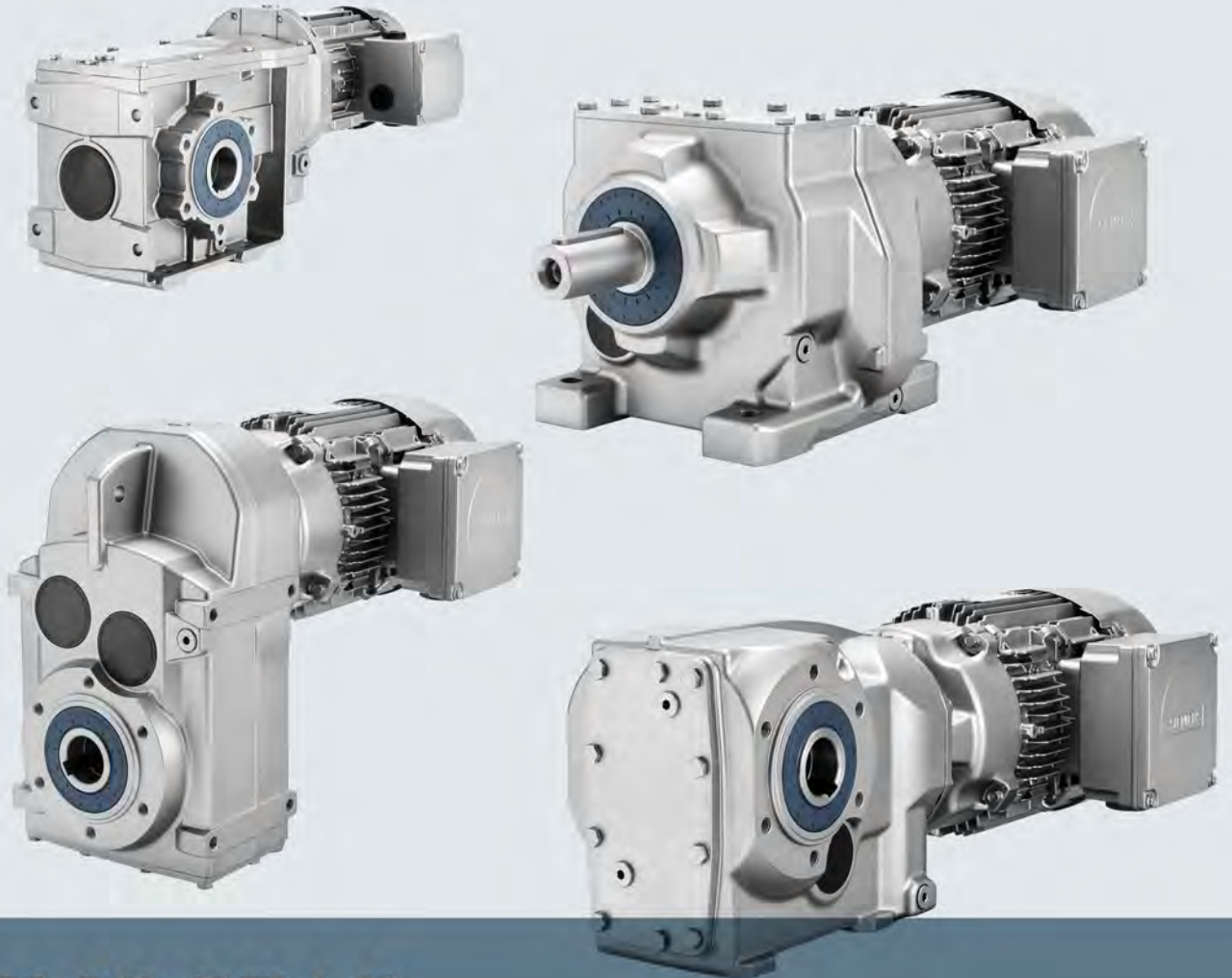
| | |
|--|-----------------------------|
| Mounting position: | [D14] M4 output side A |
| Special installation (Angle): | - |
| Permissible mount. position deviation: | - |
| Mount. pos. deviation (Angle): | - |
| Mounting type: | Housing flange |
| Position of torque arm: | - |
| Flange diameter: | - |
| Output flange tightened: | - |
| Output shaft: | H50 |
| Output shaft bearing: | Standard bearing |
| Hollow shaft cover: | Sealing cap |
| Gear oil: | [K06] Mineral oil CLP VG220 |
| Output shaft sealing: | Standard sealing |
| Gearbox breather: | Pressure breather valve |
| Oil level control: | Oil level screw |
| Electr. oil temperature monitoring: | - |
| Disconnecter unit, 24 V param.: | - |
| Adapter cable USB/jacks: | - |
| Oil level gauge: | - |
| Separation switch gear: | - |

| | |
|-----------------------------------|----------------|
| Oil drain: | Oil drain plug |
| Housing material: | Cast iron |
| Backlash Design: | - |
| Relubrication: | - |
| Drywell: | - |
| 24 V Drywell switch disconnecter: | - |
| Flange-Figure: | - |

| |
|-------------------------------|
| Performance data motor |
|-------------------------------|

| | |
|---------------------|----------|
| Input speed (Info): | 1755 rpm |
| Motor power (Info): | 1.49 kW |

SIEMENS



SIMOGEAR

Gearbox

BA 2030

Operating instructions

Edition

04/2016

Answers for industry.

4.5 Gearbox with flange fastening

Note

Siemens AG recommends an anaerobic adhesive to enhance the friction lock between flange and mounting surface.

Table 4- 3 Thread size of the fastening bolt

| Thread size | Flange | Helical gearbox D/Z | Parallel shaft gearbox F | Bevel gearbox B, K | Helical worm gearbox C |
|-------------|------------|------------------------|-----------------------------|-----------------------|---------------------------|
| | | Size | | | |
| M6 | A120 | 19, 29, 39 | 29 | B29 | 29 |
| M8 | A140, A160 | 19, 29, 39, 49, 59 | 29, 39 | B29, B39, K39 | 39 |
| M10 | A200 | 39, 49, 59, 69 | 49 | B39, B49, K49 | 49, 69 |
| M12 | A250, A300 | 59, 69, 79, 89 | 69, 79, 89 | K69, K79, K89 | 89 |
| M16 | A350 | 89, 109, 129 | 109 | K109 | - |
| M16 | A450 | 109, 129, 149, 169 | 129, 149 | K129, K149 | - |
| M16 | A550 | 169, 189 | 169 | K169 | - |
| M20 | A660 | 189 | 189 | K189 | - |

Use screws / nuts of strength class 8.8 for gearboxes with a flange-mounted design.

Note the following exceptions:

Table 4- 4 Strength class of the fastening bolt for FF/FAF and KF/KAF

| Gearbox size | Flange | Strength class for motor size | | | | | | | | | | |
|-----------------|--------|-------------------------------|------|------|------|------|------|------|------|------|------|------|
| | | 90 | 100 | 112 | 132 | 160 | 180 | 200 | 225 | 250 | 280 | 315 |
| 39 | A160 | 10.9 | 10.9 | - | - | - | - | - | - | - | - | - |
| 49 | A200 | 8.8 | 10.9 | 10.9 | 10.9 | - | - | - | - | - | - | - |
| 69 | A250 | 8.8 | 8.8 | 8.8 | 10.9 | - | - | - | - | - | - | - |
| 79 | A250 | 8.8 | 8.8 | 8.8 | 10.9 | 10.9 | - | - | - | - | - | - |
| 89 | A300 | 8.8 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | - | - | - | - | - |
| 109 | A350 | 8.8 | 8.8 | 8.8 | 8.8 | 10.9 | 10.9 | 10.9 | 10.9 | - | - | - |
| 129 | A450 | 8.8 | 8.8 | 8.8 | 8.8 | 8.8 | 8.8 | 8.8 | 8.8 | - | - | - |
| 149 | A450 | - | 8.8 | 8.8 | 8.8 | 8.8 | 8.8 | 10.9 | 10.9 | 10.9 | - | - |
| 169 | A550 | - | - | 8.8 | 8.8 | 8.8 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | - |
| 189 | A660 | - | - | 8.8 | 8.8 | 8.8 | 8.8 | 8.8 | 8.8 | 10.9 | 10.9 | 10.9 |

4.9 Installing and removing the shaft-mounted gearbox

4.9.1 General information on installing the shaft-mounted gearbox

| |
|---|
| NOTICE |
| Damage to shaft sealing rings caused by solvent Avoid any contact of solvent or benzine with the shaft sealing rings. |

| |
|--|
| NOTICE |
| Subjecting stress to the hollow shaft causes bearing failure Skewing or stressing the hollow shaft increases the loading. This can cause bearing failure. The hollow shaft must be flush with the machine shaft to avoid misalignment. Do not subject the hollow shaft to axial and radial stress. |

| |
|--|
| NOTICE |
| For shrink disks: Lubricants in the area between the hollow shaft and machine shaft impair torque transmission Keep the bore in the hollow shaft and the machine shaft completely grease-free. Do not use impure solvents and soiled cleaning cloths. |

Note

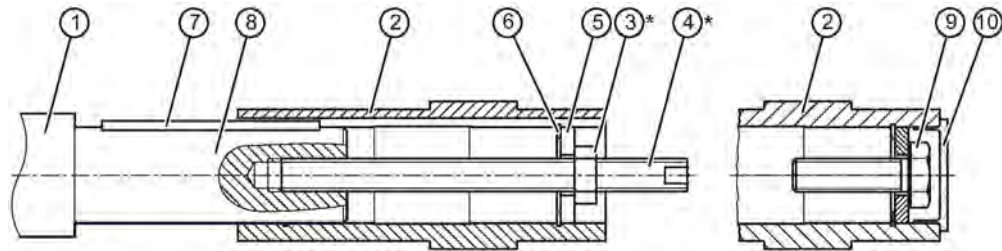
Coat the contact surfaces with the mounting paste supplied with the product or any suitable lubricant to prevent frictional corrosion.

Note

Observe the permissible concentricity tolerance of the cylindrical shaft extension of the machine shaft to the housing axle according to DIN 42955.

4.9.2 Hollow shaft with parallel key

4.9.2.1 Mounting the hollow shaft with parallel key



* Not included in scope of supply

- | | |
|--------------------|------------------|
| ① Machine shaft | ⑥ Circlip |
| ② Hollow shaft | ⑦ Parallel key |
| ③ Hexagon nut | ⑧ Mounting paste |
| ④ Threaded spindle | ⑨ Bolt |
| ⑤ Disk | ⑩ Sealing caps |

Image 4-4 Mounting the hollow shaft with parallel key

Instead of the nut and threaded spindle shown in the diagram, other types of equipment such as hydraulic lifting equipment may be used.

Procedure

1. Using benzine or a solvent, remove the anti-corrosion protection from the shaft ends and flanges.
2. Check the seats or edges of the hollow and machine shafts for damage. Contact Technical Support if you notice any damage.
3. Apply the mounting paste provided ① to the machine shaft ⑧. Apply the paste uniformly.
4. Fit the gearbox using the disk ⑤, threaded spindle ④ and nut ③. Support is provided by the hollow shaft ②.
5. Replace the nut ③ and the threaded spindle ④ with a screw ⑨. Tighten the bolts ⑨ to the specified torque.
6. Close the open hollow shaft end using a sealing cap ⑩.

You have mounted the hollow shaft with feather key.

Table 4- 6 Tightening torque for the screw

| Thread size | M5 | M6 | M8 | M10 | M12 | M16 | M20 | M24 | M30 |
|------------------------|----|----|----|-----|-----|-----|-----|-----|-----|
| Tightening torque [Nm] | 5 | 8 | 8 | 14 | 24 | 60 | 120 | 200 | 400 |

4.9.2.2 Removing the hollow shaft with parallel key

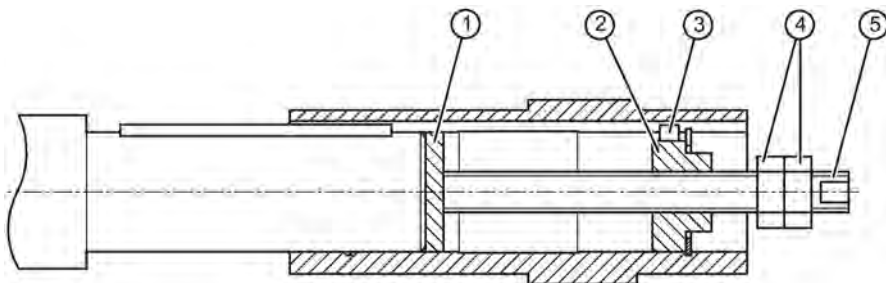
⚠ WARNING
Inadequately secured gearbox or geared motors can free themselves
Before driving out the machine shaft, fasten a suitably dimensioned means of absorbing load to the gearbox.
Slightly pretension the pulling equipment so that the gearbox does not drop onto it when the insert shaft is released.

NOTICE
Subjecting stress to the hollow shaft causes bearing failure
It is essential to prevent misalignment when removing the unit.

NOTICE
Excessive forces during removal
Excessive forces can occur during removal of the hollow shaft via the housing.
Stresses in the hollow shaft can lead to bearing failure and damage to the gearbox housing.

Note

If frictional corrosion has occurred on the seat surfaces, use rust solvent to facilitate the removal of the gearbox. Allow an adequately long time for the rust solvent to take effect.



Items ① to ⑤ are not included in the scope of supply.

- | | |
|------------------|---------------|
| ① Disk | ④ Hexagon nut |
| ② Threaded block | ⑤ Leadscrew |
| ③ Parallel key | |

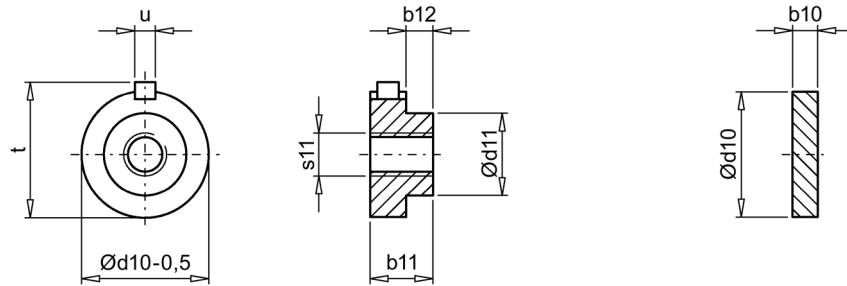
Image 4-5 Removing the hollow shaft with parallel key

Procedure

1. Remove the axial locking element from the hollow shaft.
2. Drive out the machine shaft using the disk ①, threaded block ②, feather key ③, threaded spindle ⑤ and hexagon nuts ④.

You have now removed the hollow shaft with parallel key.

Design suggestion for threaded block and disk



| Gearbox | Size | Hollow shaft \varnothing | b10 | b11 | b12 | d10 | d11 | s11 | t _{max} | u |
|------------|------|----------------------------|------|------|------|-------|------|------|------------------|------|
| | | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] |
| B | 19 | 20 | 3 | 15 | 10 | 19.9 | 10 | M6 | 22.5 | 6 |
| B, C | 29 | 20 | 3 | 15 | 10 | 19.9 | 10 | M6 | 22.5 | 6 |
| B, F | 29 | 25 | 3 | 15 | 10 | 24.9 | 16 | M10 | 28 | 8 |
| C | 39 | 25 | 3 | 15 | 10 | 24.9 | 16 | M10 | 28 | 8 |
| B, K, F, C | | 30 | 6 | 15 | 10 | 29.9 | 18 | M10 | 33 | 8 |
| B | | 35 | 6 | 15 | 10 | 34.9 | 24 | M12 | 38 | 10 |
| B | | 40 | 6 | 15 | 10 | 39.9 | 28 | M16 | 43 | 12 |
| C | 49 | 30 | 6 | 15 | 10 | 29.9 | 18 | M10 | 33 | 8 |
| K, F, C | | 35 | 6 | 15 | 10 | 34.9 | 24 | M12 | 38 | 10 |
| B | | 40 | 6 | 15 | 10 | 39.9 | 28 | M16 | 43 | 12 |
| K, F, C | 69 | 40 | 6 | 20 | 9 | 39.9 | 28 | M16 | 43 | 12 |
| C | | 45 | 6 | 20 | 9 | 44.9 | 36 | M16 | 48 | 14 |
| K, F | 79 | 40 | 6 | 20 | 9 | 39.9 | 28 | M16 | 43 | 12 |
| K, F, C | 89 | 50 | 7 | 20 | 10 | 49.9 | 36 | M16 | 53.5 | 14 |
| C | | 60 | 7 | 20 | 10 | 59.9 | 45 | M20 | 64 | 18 |
| K, F | 109 | 60 | 10 | 24 | 14 | 59.9 | 45 | M20 | 64 | 18 |
| K, F | 129 | 70 | 10 | 24 | 14 | 69.9 | 54 | M20 | 74.5 | 20 |
| K, F | 149 | 90 | 10 | 24 | 14 | 89.9 | 72 | M20 | 95 | 25 |
| K, F | 169 | 100 | 10 | 30 | 15 | 99.9 | 80 | M24 | 106 | 28 |
| K, F | 189 | 120 | 10 | 30 | 15 | 109.9 | 80 | M24 | 127 | 32 |

8.2 Checking and changing lubricants

8.2.1 General safety notes

 **WARNING**

Danger of scalding from the hot oil emerging from the unit

Before starting any work wait until the oil has cooled down to below +30 °C.

 **WARNING**

Risk of slipping on oil

Remove any oil spillage immediately with an oil-binding agent in compliance with environmental requirements.

NOTICE

Damage to the gearbox caused by incorrect oil quantities

The oil quantity and the position of the sealing elements are determined by the mounting position.

After removing the oil level screw, the oil level may not be below the specified fill level.

NOTICE

Damage to the gearbox due to open oil holes

Dirt and damaging atmosphere can penetrate through open oil holes.

Close the gearbox immediately after checking the oil level or changing the oil.

Note

Information about oil

Refer to the rating plate for the type of oil, oil viscosity and quantity of oil required.

For oil compatibility, see Recommended lubricants (Page 74).

Note

Gearbox sizes 19 and 29

Gearbox sizes 19 and 29 are lubricated for life. There is no opening to check the oil level. An oil change is not required.

In mounting positions M2 and M4 the gearboxes are equipped with a breather valve.

C29 has a breather valve in all mounting positions.

Note

Tandem gearbox - intermediate helical gearbox

- In a horizontal operating position the bulging part of the housing of the intermediate helical gearbox generally faces vertically downwards.
- The oil quantity is specified for every individual gearbox and is valid for the standard mounting position.
- Perform the following work for each individual gearbox:
 - Check the oil level.
On the main gearboxes D/Z, F, K it is not possible to check the oil level in mounting position M4. The oil level is above the oil level bore so that the bearings above it are lubricated.
 - Check the oil quality.
 - Change the oil.
 - Fill in oil and top it up.

Note

Gearbox in special mounting position

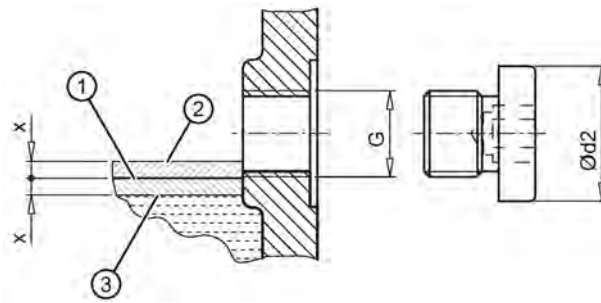
The gearbox is intended for a specific rotation angle and is delivered with the correct quantity of oil for this purpose.

It is not possible to check the oil level. You will find information regarding oil quantity and type of oil on the rating plate.

When draining the oil a higher residual quantity of oil may remain in the gearbox. When you carry out an oil change remove any residual oil.

8.2.2 Checking the oil level

| |
|---|
| NOTICE |
| The volume of gearbox oil changes with temperature If the temperature rises, the volume increases. Where temperature differences and filling quantities are significant, the volume difference can amount to several liters. The oil level must therefore be checked while still slightly warm, approximately 30 minutes after switching off the drive unit. |



- ① Specified oil level
- ② Maximum oil level
- ③ Minimum oil level

Image 8-1 Oil level in the gearbox housing

Table 8- 2 Minimum and maximum fill levels x

| Oil level hole | Ød2 | Fill level x | Tightening torque |
|----------------|------|--------------|-------------------|
| | [mm] | | |
| G 1/8" | 14 | 2.5 | 10 |
| G 1/4" | 18 | 3 | 10 |
| G 3/8" | 22 | 4 | 25 |
| G 3/4" | 32 | 7 | 50 |

Procedure

1. Switch off the power supply to the drive unit.
 2. Unscrew the oil level screw, see Mounting positions (Page 87). Oil escapes if the maximum fill level is above the plug hole.
 3. Check the oil level. Observe the fill level x.
 4. Top up the oil level if necessary and check it again.
 5. Check the state of the sealing ring on the sealing element. If the sealing ring is damaged, replace the sealing element with a new one.
 6. After checking, seal the gearbox immediately using the sealing element.
- You have now checked the oil level in the gearbox housing.

8.2.3 Checking the oil level using the oil sight glass (optional)

If there is an oil sight glass to check the oil level ①, the oil must be visible in the center of the sight glass when the oil is cool. When the oil is hot, the oil level ① is above the center of the sight glass. The oil level ① of cold oil is below the center of the sight glass.

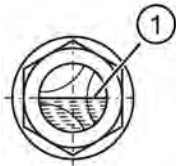


Image 8-2 Oil level in the oil sight glass

Top up the oil level ① if necessary, and check it again.

8.2.4 Checking the oil quality

Visible signs show effects on the oil. Fresh oil is clear to the eye, and has a typical smell and a specific product color. Clouding or a flocculent appearance indicates water and / or contamination. A dark or black color indicates residue, serious thermal decomposition or contamination.

Observe the symbols in the diagrams of the Mounting positions (Page 87):



Venting



Oil level

Procedure

1. Allow the geared motor to run for a short time. Wear and contaminant particles are visible in the oil shortly after shutting down.
2. Switch off the power supply to the drive unit.
3. Unscrew the sealing element at one of the points marked with the symbols listed above.
4. Remove some oil, using a suction pump and a flexible hose, for example.
5. Check the state of the sealing ring on the sealing element. When required, replace the sealing ring.
6. Seal the gearbox with the sealing element.
7. Check the oil for abnormalities. Change the oil immediately if you determine any abnormalities, see Changing the oil (Page 67).

You have now checked the oil quality.

8.2.5 Changing the oil

8.2.5.1 General safety notes for changing the oil

NOTICE**Impermissible mixing of oils leads to damage**

Impermissible mixing of oils leads to:

- Darkening
- Sediment
- Foam formation
- Change of the viscosity or reduced corrosion protection
- Wear protection.

When changing oil of the same type, the residual volume of oil in the gearbox should be kept as low as possible. Generally speaking, a small residual volume will cause no particular problems.

Gear oils of different types and by different manufacturers must not be mixed. Have the manufacturer confirm that the new oil is compatible with the remaining volume of used oil.

If very different types of oil or oils with very different additives are changed, always flush out the gearbox with the new oil. When changing from mineral oil to polyglycol oil (PG) or vice versa, it is vital to flush the gearbox twice. All traces of old oil must be completely removed from the gearbox.

NOTICE**Contaminations of the oil impair the lubricity**

Do not mix the gearbox oil with other substances.

Do not flush with paraffin or other solvents, as traces of these substances will always remain inside the gearbox.

Note

The oil must be warm because insufficient viscosity caused by oil that is too cold impairs correct emptying.

If necessary, run the gearbox for 15 to 30 minutes to become warm.

8.2.5.2 Draining the oil

Observe the symbols in the diagrams of the Mounting positions (Page 87):



Venting



Oil level



Oil drain

Procedure

1. Switch off the power supply to the drive unit.
2. Unscrew the vent plug.
3. Place a suitable and sufficiently large receptacle underneath the oil drain plug.
4. Remove the oil drain plug. Drain all the oil into the receptacle.
5. Check the state of the sealing ring on the sealing element. If the sealing ring is damaged, replace the sealing element with a new one.
6. After draining the oil, seal the gearbox immediately using the sealing element.

You have now drained the oil from the gearbox.

8.2.5.3 Flushing the gearbox when changing between incompatible oils

WARNING

Impermissible mixing of oils leads to damage

Residual quantities of original oil can impair the specific properties of the new oil.

A flushing process is required with biodegradable and physiologically safe oils.

The residual corrosion protection oil must amount to no more than 1% of the operating oil volume.

Note

Polyglycol oil has a higher density than mineral oil. Therefore, it sinks down towards the oil drain and the mineral oil floats on top.

This makes the required complete draining of mineral oil from the gearbox extremely difficult.

Note

After the second flush, we recommend that an appropriate analysis institute checks the quality of the flushed fluid.

Observe the symbols in the diagrams of the Mounting positions (Page 87):



Venting



Oil drain

Procedure

1. After the oil has been drained, wipe the gearbox clean of any remaining mineral oil using a cloth.
2. Unscrew the vent plug.
3. Fill the gearbox with a flushing oil, using a filter (filter mesh max. 25 µm). For the flushing oil, use either the new oil or one that is compatible with the new oil and is less expensive.
4. Operate the gearbox for 15 to 30 minutes under a low load.
5. Place a suitable and sufficiently large receptacle underneath the oil drain plug.
6. Remove the oil drain plug. Drain all the oil into the receptacle.
7. After flushing, immediately seal the gearbox using the sealing element.
8. Repeat this step for the second flushing.

You have now flushed the gearbox twice and can pour in the new oil.

8.2.5.4 Filling in oil

| |
|---|
| NOTICE |
| Mixing of different oils impairs the lubricity |
| When adding oil, use the same oil type and viscosity. If changing mutually incompatible oils, see Flushing the gearbox (Page 68). |

Observe the symbols in the diagrams of the Mounting positions (Page 87):



Venting

Procedure

1. Unscrew the vent plug.
2. Fill the gearbox with fresh oil. Use a filler filter with mesh of max. 25 µm.
3. Check the oil level.
4. Top up the oil level if necessary and check it again.
5. Check the state of the sealing ring on the sealing element. If the sealing ring is damaged, replace the sealing element with a new one.
6. After filling with oil, seal the gearbox immediately using the sealing element.

You have now filled up the gearbox with oil.

8.2.6 Topping up with oil

If the mounting position of the gearbox is changed or oil lost because of leakage, check the oil level. If you notice oil escaping, locate the leak and seal the affected area. Top up and check the oil level.

At the time of going to print, the following types of oil are being used when the gearbox is filled for the first time:

CLP ISO VG220: Castrol Alpha SP 220

CLP ISO PG VG220: Castrol Tribol / Optigear Synthetic 1300/220

CLP ISO PG VG460: Castrol Tribol / Optigear Synthetic 1300/460

CLP ISO PAO VG68: Addinol Eco Gear 68S-T

CLP ISO PAO VG220: Addinol Eco Gear 220S

CLP ISO E VG220: Fuchs Plantogear Bio 220S

CLP ISO H1 VG100: Klüber Klübersynth UH1 6 100

CLP ISO H1 VG460: Castrol Tribol Foodproof / Optilep GT 1800/460

If, following agreement, the gearbox is filled at the factory with special lubricant for the special applications referred to above, the lubricant must be shown on the rating plate.

8.2.7 Change the roller bearing grease

The roller bearings are lubricated in the factory with the greases listed in the table.

Renew the grease quantify for grease-lubricated bearings with each oil change.

Clean the bearing before filling it with fresh lubricant.

In the case of bearings on the output shaft or intermediate shafts, the grease quantity must fill 2/3, and in the case of bearings on the input side, 1/3 of the space between the rolling elements.

Table 8- 3 Roller-bearing and shaft-sealing-ring grease

| Fields of application | Ambient temperature | Manufacturer | Type |
|---|---------------------|--------------|---|
| Standard | -40 °C to +80 °C | Klüber | Petamo GHY 133 N |
| Foodstuff-compatible for the food industry | -30 °C to +40 °C | Castrol | Obeen UF F2 NSF H1 / Optileb GR UF 2 NSF H1 |
| Biologically degradable, for agriculture, forestry and water industries | -35 °C to +40 °C | BP | Biogrease EP 2 |

8.2.8 Service life of the lubricants

Note

In case of ambient conditions deviating from normal conditions, e.g. high ambient temperatures, high relative humidity, aggressive ambient media, the intervals between changes should be shorter. In such cases, contact Technical Support for assistance in determining the individual lubricant change interval.

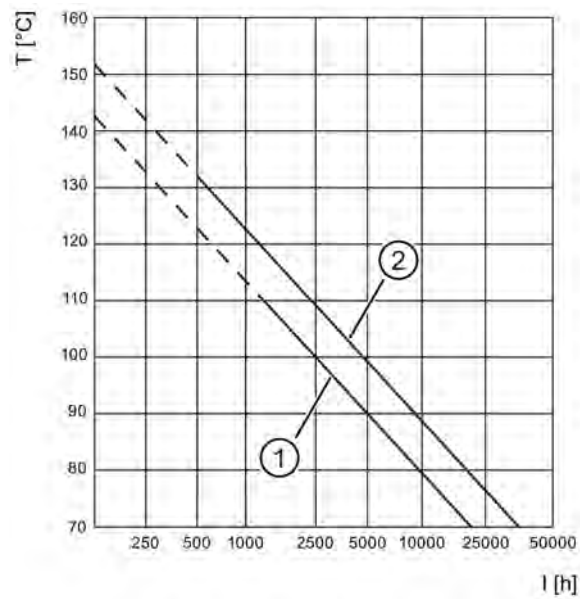
Note

Oil sump temperatures above +80 °C can reduce service life. A temperature increase by 10 K halves the service life by the amount as shown in the figure titled "Guide values for oil change intervals".

For a +80 °C oil sump temperature, the following service life can be expected when observing the properties specified by Siemens AG:

Table 8- 4 Service life of the oils

| Type of oil | Service life |
|---|-----------------------------------|
| Mineral oil | 10 000 operating hours or 2 years |
| Biodegradable oil | |
| Physiologically safe oil according to USDA-H1/-H2 | |
| Synthetic oil | 20 000 operating hours or 4 years |



- ① Mineral oil
- ② Synthetic oil
- T Oil-bath steady-state temperature [°C]
- I Oil change interval in operating hours [h]

Image 8-3 Guide values for oil change intervals


Grease service life of roller bearing greases

Roller bearings and the clearance in front are filled with sufficient grease.

Under approved operating conditions and ambient temperatures, no regreasing is required.

We recommend that the grease in the bearings is also renewed when the oil or shaft sealing rings are replaced.

8.2.9 Recommended lubricants

 **DANGER**

Used lubricants only have conditional approval

The used lubricants are not or only conditionally approved for use in the foodstuff or pharmaceutical industry.

Use only lubricants with USDA (United States Department of Agriculture) H1 / H2 approval for deployment in the foodstuff or pharmaceutical industry.

The released and recommended lubricants are listed in the T 7300 Operating Instructions.

NOTICE

Incorrect operating temperatures impair the lubricity of the gearbox oil

Operating temperatures outside the permitted range impair the lubricating property of the gearbox oil.

The temperature ranges are listed in the T 7300 Operating Instructions, Gearbox Lubrication. If you are working outside the specified temperature ranges, please contact Technical Support for advice on which oil to use.

If the housing temperature exceeds a value of +80 °C, please contact Technical Support.

Note

As standard, the lubricants and shaft seals are harmonized and coordinated with one another corresponding to the prevailing operating conditions.

Contact Technical Support for:

- Change of the operating conditions
- Change in oil grade
- Deployment of new shaft seals.

Note

The lubricants used are not at all or only conditionally biodegradable. If biologically degradable lubricants are required, use only gearbox lubricants with the appropriate classification listed in the T 7300 Operating Instructions.

Note

These recommendations are not a guarantee of the lubricant quality provided by your supplier. All lubricant manufacturers are responsible for the quality of their own products.

The oil viscosity is decisive for the oil selection (ISO VG class). The viscosity is specified on the rating plate of the gearbox. The viscosity class indicated applies for the contractually agreed operating conditions.

In the case of different operating conditions, please contact Technical Support.

If, following agreement, the gearbox is filled at the factory with special lubricant for the special applications referred to above, the lubricant is shown on the rating plate.

The quality of the oil used must comply with the requirements laid down in the BA 7300 Operating Instructions; otherwise, the Siemens warranty is null and void. We recommend the use of an approved gearbox lubricant specified in the T 7300

(<http://support.automation.siemens.com/WW/view/en/44231658>) Operating Instructions.

These oils have been tested appropriately and satisfy the requirements.

The oils listed in the operating instructions are subject to continuous testing. It is possible that the oils recommended in the operating instructions are at a later point in time removed or replaced by oils that have been further developed.

We recommend that you regularly check as to whether the selected lubricating oil is still recommended by Siemens. Otherwise change the product.

8.3 Replace bearings

The bearing service life depends greatly on the operating conditions and so cannot be calculated reliably. In the operating conditions specified by the operator, bearing life can be calculated and indicated on the rating plate. If no information is given, changes in vibration and noise pattern can serve as an indicator that an immediate bearing replacement is necessary.

10.5 Mounting positions

10.5.1 General notes on mounting positions

Only operate the gearbox in the mounting position specified on the rating plate. This ensures that the correct quantity of lubricant is provided. The symbols are shown for the standard mounting position.

Note

Gearbox sizes 19 and 29

Gearbox sizes 19 and 29 are lubricated for life. There is no opening to check the oil level.

In mounting positions M2 and M4 the gearboxes are equipped with a breather valve.

C29 has a breather valve in all mounting positions.

Description of the symbols:



Venting



Oil level



Oil drain

A, B Position of insert shaft / solid shaft

* On opposite side

② Two-stage gearbox

③ Three-stage gearbox

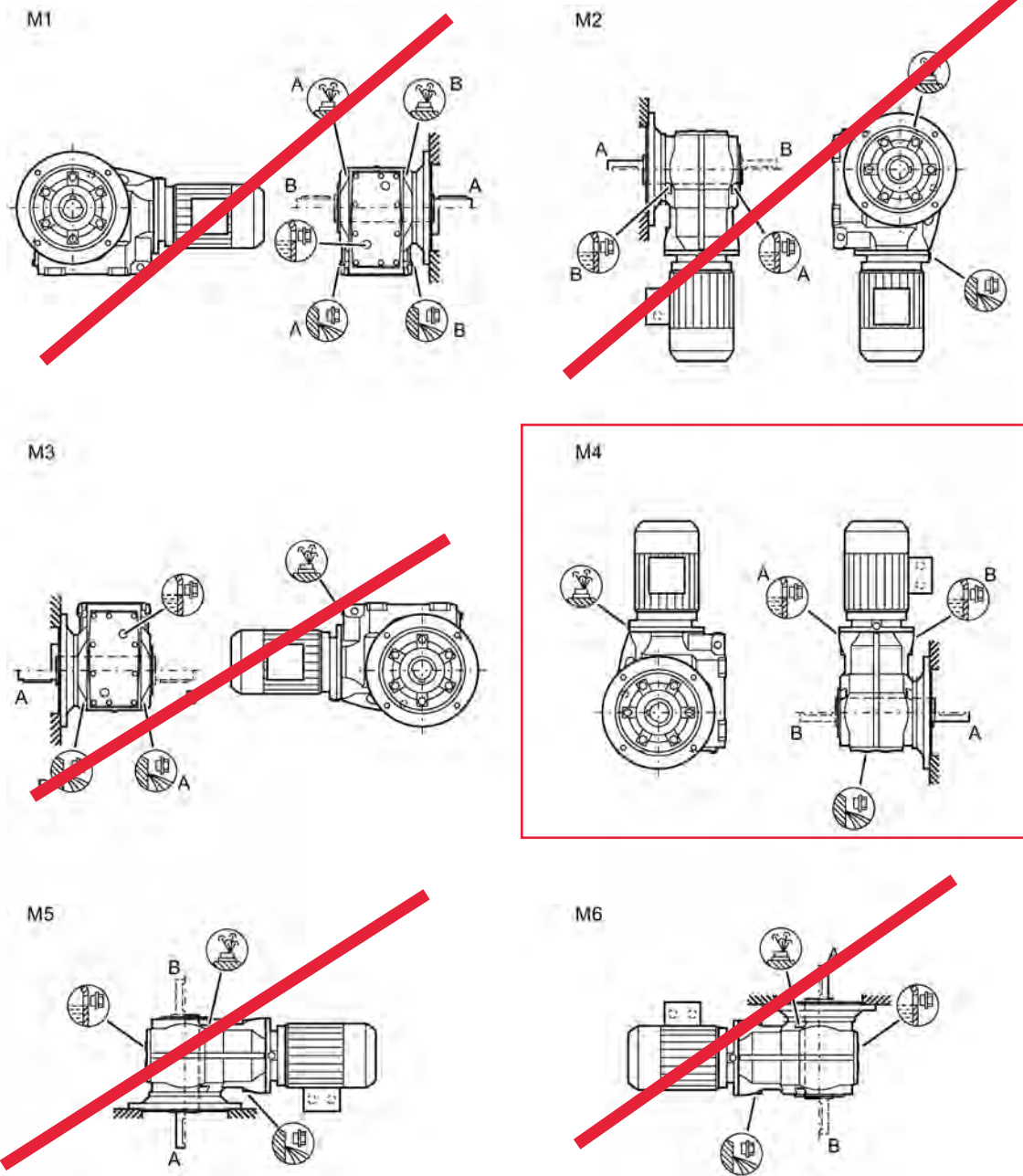


Image 10-23 Mounting positions for bevel gearbox K.F flange-mounted design and KAZ with housing flange, sizes 39 - 189

10.6.2 Parallel shaft gearbox

Table 10- 4 Oil quantities [l] for FD/Z, FD/ZZ, FD/ZA., FD/ZAF., FD/ZAZ., FD/ZAD., sizes 29 - 189

| Type | Mounting position | | | | | |
|--------|-------------------|------|------|------|------|------|
| | M1 | M2 | M3 | M4 | M5 | M6 |
| FD.29 | 0.6 | 0.8 | 0.35 | 0.6 | 0.45 | 0.45 |
| FD.39 | 0.95 | 1.1 | 0.7 | 1.2 | 0.8 | 0.8 |
| FD.49 | 2.1 | 2.3 | 1.5 | 2.3 | 1.5 | 1.5 |
| FD.69 | 2.2 | 2.7 | 1.6 | 2.7 | 1.8 | 1.8 |
| FD.79 | 3 | 3.8 | 2.7 | 3.9 | 2.6 | 2.7 |
| FD.89 | 5.6 | 7.6 | 5.9 | 7.8 | 5.1 | 5.2 |
| FD.109 | 9.5 | 13 | 9.2 | 11.8 | 8.5 | 8.5 |
| FD.129 | 16.1 | 20 | 16.3 | 23.5 | 14.9 | 15 |
| FD.149 | 24.5 | 32.5 | 23 | 34 | 21.5 | 22 |
| FD.169 | 39 | 50 | 37 | 54 | 34.5 | 35.5 |
| FD.189 | 64 | 74 | 48 | 77 | 51.5 | 52 |
| FZ.29 | 0.6 | 0.9 | 0.4 | 0.7 | 0.5 | 0.45 |
| FZ.39 | 0.95 | 1.3 | 0.8 | 1.4 | 0.9 | 0.85 |
| FZ.49 | 1.6 | 2.5 | 1.6 | 2.5 | 1.6 | 1.6 |
| FZ.69 | 2.2 | 2.8 | 1.6 | 2.9 | 1.9 | 1.9 |
| FZ.79 | 2.8 | 4.1 | 2.9 | 4.2 | 2.7 | 2.9 |
| FZ.89 | 4.9 | 7.7 | 5.9 | 8.4 | 5.2 | 5.5 |
| FZ.109 | 9.1 | 13.7 | 9.4 | 13.1 | 9 | 9.3 |
| FZ.129 | 15.6 | 21.5 | 16.7 | 25 | 15.6 | 16.3 |
| FZ.149 | 23.5 | 34 | 24 | 37 | 22.5 | 24 |
| FZ.169 | 38 | 54 | 37.5 | 59 | 36.5 | 38.5 |
| FZ.189 | 57 | 77 | 50 | 80 | 52.5 | 54 |

Table 10- 5 Oil quantities [l] for FD/ZF, sizes 29 - 189

| Type | Mounting position | | | | | |
|--------|-------------------|------|------|------|------|------|
| | M1 | M2 | M3 | M4 | M5 | M6 |
| FDF29 | 0.6 | 0.8 | 0.35 | 0.6 | 0.45 | 0.45 |
| FDF39 | 1 | 1.2 | 0.75 | 1.3 | 0.8 | 0.85 |
| FDF49 | 2.2 | 2.3 | 1.5 | 2.4 | 1.6 | 1.5 |
| FDF69 | 2.4 | 2.8 | 1.6 | 2.9 | 1.9 | 1.9 |
| FDF79 | 3.1 | 3.9 | 2.7 | 4 | 2.7 | 2.6 |
| FDF89 | 5.8 | 7.6 | 5.8 | 8 | 5.2 | 5.2 |
| FDF109 | 9.7 | 13 | 9.2 | 12 | 8.6 | 8.6 |
| FDF129 | 16.4 | 20 | 16.3 | 23.5 | 15.1 | 15.2 |
| FDF149 | 25 | 32.5 | 23 | 35 | 22 | 22.5 |
| FDF169 | 40.5 | 50 | 37 | 56 | 35.5 | 36.5 |

| Type | Mounting position | | | | | |
|--------|-------------------|------|------|------|------|------|
| | M1 | M2 | M3 | M4 | M5 | M6 |
| FDF189 | 60 | 74 | 48 | 79 | 55 | 53 |
| FZF29 | 0.6 | 0.9 | 0.4 | 0.7 | 0.5 | 0.45 |
| FZF39 | 1 | 1.4 | 0.85 | 1.1 | 0.95 | 0.9 |
| FZF49 | 1.8 | 2.4 | 1.5 | 2.6 | 1.6 | 1.6 |
| FZF69 | 2.4 | 2.9 | 1.7 | 3.1 | 2 | 2 |
| FZF79 | 2.9 | 4.2 | 2.9 | 4.3 | 2.9 | 2.8 |
| FZF89 | 5.1 | 7.7 | 5.8 | 8.6 | 5.3 | 5.4 |
| FZF109 | 9.2 | 13.7 | 9.4 | 13.3 | 9.1 | 9.4 |
| FZF129 | 16 | 21.5 | 16.7 | 25.5 | 15.8 | 16.5 |
| FZF149 | 24 | 34 | 24 | 38 | 23 | 24.5 |
| FZF169 | 39.5 | 54 | 37.5 | 61 | 37.5 | 39.5 |
| FZF189 | 60 | 77 | 50 | 82 | 53.5 | 55 |

10.6.3 Bevel gearbox

Table 10- 6 Oil quantities [l] for B., sizes 19 - 49


| Type | Mounting position | | | | | |
|------|-------------------|------|-----|------|------|-----|
| | M1 | M2 | M3 | M4 | M5 | M6 |
| B.19 | 0.15 | 0.3 | 0.4 | 0.5 | 0.3 | 0.3 |
| B.29 | 0.25 | 0.55 | 0.7 | 0.85 | 0.55 | 0.5 |
| B.39 | 0.5 | 0.95 | 1.3 | 1.6 | 0.95 | 0.9 |
| B.49 | 1 | 1.7 | 2.4 | 3.1 | 1.7 | 1.5 |

Table 10- 7 Oil quantities [l] for K, KA, KAS, KAT, sizes 39 - 189

| Type | Mounting position | | | | | |
|-------|-------------------|------|------|------|--------------|--------------|
| | M1 | M2 | M3 | M4 | M5-A M6-B | M6-A M5-B |
| K.39 | 0.35 | 0.85 | 1.1 | 1.2 | 0.85 | 0.9 |
| K.49 | 0.55 | 1.4 | 1.8 | 1.9 | 1.5 | 1.6 |
| K.69 | 0.75 | 2 | 2.5 | 2.7 | 2.2 | 2.2 |
| K.79 | 1 | 2.2 | 2.9 | 3.4 | 2.7 | 2.5 |
| K.89 | 1.9 | 4.5 | 6 | 6.8 | 5 | 5.3 |
| K.109 | 3 | 7.2 | 9.2 | 10.5 | 7.1 | 7.5 |
| K.129 | 5.2 | 13.4 | 16.6 | 19.5 | 13.2 | 13.6 |
| K.149 | 9.3 | 21 | 28 | 33 | 21.5 | 22.5 |
| K.169 | 17 | 31 | 47 | 57.5 | 35.5 | 38.5 |
| K.189 | 24.5 | 53 | 73 | 87 | 53.5 | 59 |

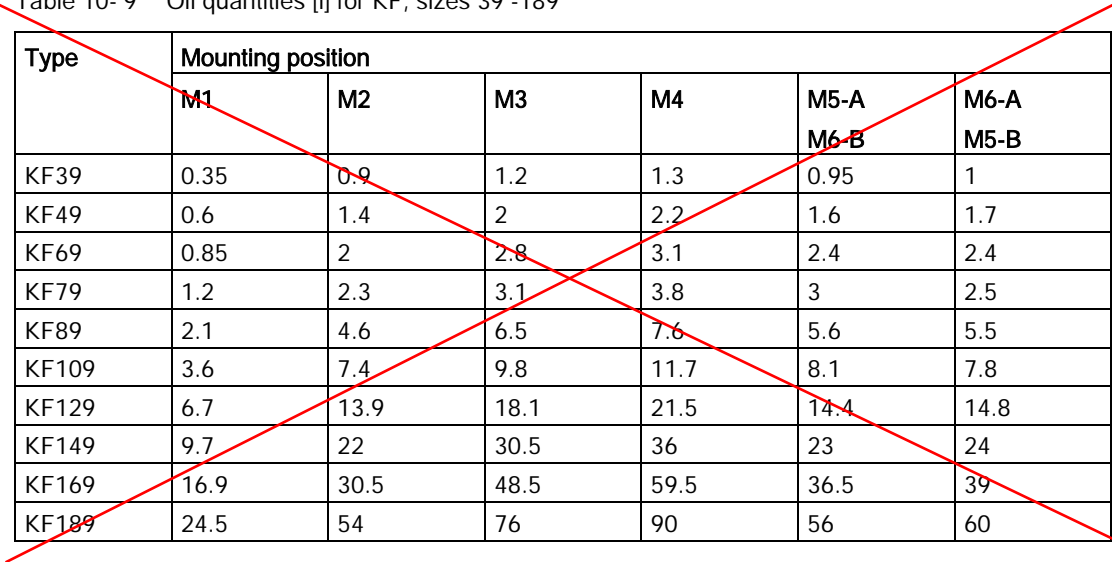
10.6 Oil quantities

Table 10- 8 Oil quantities [l] for KZ, KAF., KAZ., KAD., sizes 39 - 189



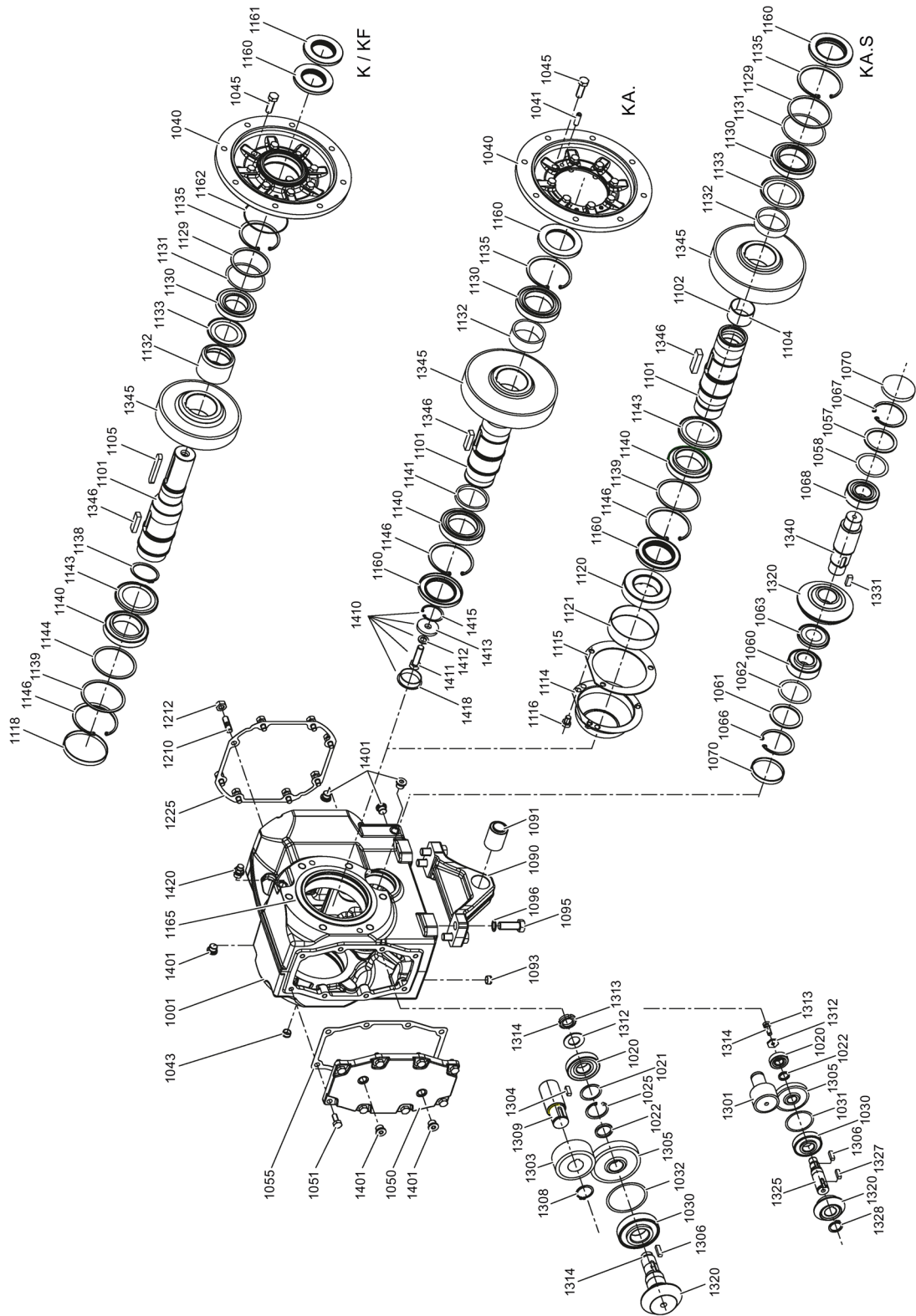
| Type | Mounting position | | | | | |
|-------|-------------------|------|------|------|--------------|--------------|
| | M1 | M2 | M3 | M4 | M5-A M6-B | M6-A M5-B |
| K.39 | 0.4 | 0.9 | 1.2 | 1.3 | 0.95 | 0.95 |
| K.49 | 0.65 | 1.5 | 1.9 | 2.2 | 1.6 | 1.6 |
| K.69 | 0.85 | 2.1 | 2.8 | 3.2 | 2.4 | 2.5 |
| K.79 | 1.1 | 2.4 | 3.1 | 3.7 | 2.5 | 2.7 |
| K.89 | 2.2 | 4.7 | 6.2 | 7.3 | 5.3 | 5.6 |
| K.109 | 3.7 | 7.4 | 9.6 | 11.7 | 7.6 | 8.2 |
| K.129 | 6.5 | 13.5 | 17.5 | 20.5 | 13.8 | 14.2 |
| K.149 | 9.6 | 21.5 | 29 | 34.5 | 22.5 | 23.5 |
| K.169 | 17 | 31 | 47 | 57.5 | 35.5 | 38.5 |
| K.189 | 24.5 | 53 | 73 | 87 | 53.5 | 59 |

Table 10- 9 Oil quantities [l] for KF, sizes 39 -189



| Type | Mounting position | | | | | |
|-------|-------------------|------|------|------|--------------|--------------|
| | M1 | M2 | M3 | M4 | M5-A M6-B | M6-A M5-B |
| KF39 | 0.35 | 0.9 | 1.2 | 1.3 | 0.95 | 1 |
| KF49 | 0.6 | 1.4 | 2 | 2.2 | 1.6 | 1.7 |
| KF69 | 0.85 | 2 | 2.8 | 3.1 | 2.4 | 2.4 |
| KF79 | 1.2 | 2.3 | 3.1 | 3.8 | 3 | 2.5 |
| KF89 | 2.1 | 4.6 | 6.5 | 7.6 | 5.6 | 5.5 |
| KF109 | 3.6 | 7.4 | 9.8 | 11.7 | 8.1 | 7.8 |
| KF129 | 6.7 | 13.9 | 18.1 | 21.5 | 14.4 | 14.8 |
| KF149 | 9.7 | 22 | 30.5 | 36 | 23 | 24 |
| KF169 | 16.9 | 30.5 | 48.5 | 59.5 | 36.5 | 39 |
| KF189 | 24.5 | 54 | 76 | 90 | 56 | 60 |

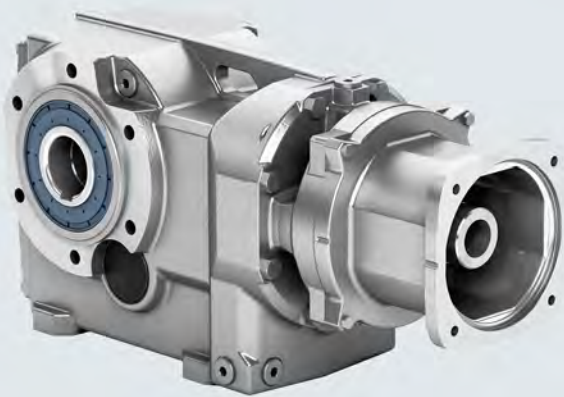
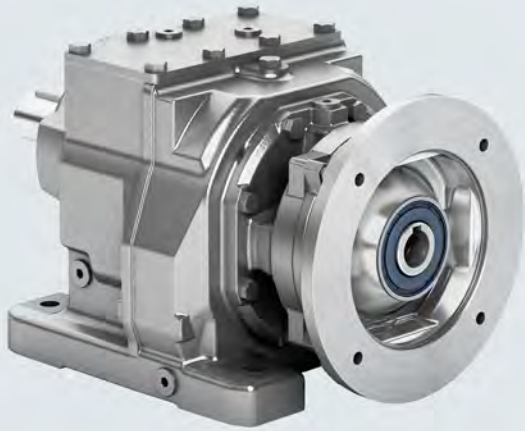
11.2.4 Bevel gearbox K, sizes 39 - 189



| | | | |
|------|------------------------|------|------------------------|
| 1001 | Gearbox housing | 1132 | Supporting disk / shim |
| 1020 | Bearing | 1133 | NILOS ring |
| 1021 | Supporting disk / shim | 1135 | Locking ring |
| 1022 | Supporting disk / shim | 1138 | Locking ring |
| 1025 | Locking ring | 1139 | Supporting disk |
| 1030 | Bearing | 1140 | Bearing |
| 1031 | Supporting disk | 1141 | Supporting disk / shim |
| 1032 | Shim | 1143 | NILOS ring |
| 1040 | Output flange | 1144 | Supporting disk / shim |
| 1041 | Pin | 1146 | Locking ring |
| 1043 | Plug | 1160 | Shaft sealing ring |
| 1045 | Bolt | 1161 | Shaft sealing ring |
| 1050 | Housing cover | 1162 | O ring |
| 1051 | Bolt | 1165 | Seal |
| 1055 | Seal | 1210 | Bolt |
| 1057 | Supporting disk | 1212 | Nut |
| 1058 | Shim | 1225 | Seal |
| 1060 | Tapered roller bearing | 1301 | Plug-in pinion |
| 1061 | Supporting disk | 1303 | Slip-on pinion |
| 1062 | Shim | 1304 | Parallel key |
| 1063 | NILOS ring | 1305 | Helical |
| 1066 | Locking ring | 1306 | Parallel key |
| 1067 | Locking ring | 1308 | Locking ring |
| 1068 | Tapered roller bearing | 1309 | Seal |
| 1070 | Sealing cap | 1312 | Disk |
| 1090 | Torque arm | 1313 | Screw / nut |
| 1091 | Rubber bush | 1314 | Screw lock |
| 1093 | Plug | 1320 | Bevel gear pair |
| 1095 | Bolt | 1325 | Pinion shaft |
| 1096 | Screw lock | 1327 | Parallel key |
| 1101 | Output shaft | 1328 | Locking ring |
| 1102 | Bushing | 1331 | Parallel key |
| 1104 | Seal | 1340 | Pinion shaft |
| 1105 | Parallel key | 1345 | Helical |
| 1114 | Cover NDE | 1346 | Parallel key |
| 1115 | Seal | 1401 | Screw plug |
| 1116 | Bolt | 1410 | Mounting accessories |
| 1118 | Plug / sealing cap | 1411 | Bolt |
| 1120 | Shrink disk | 1412 | Locking ring |
| 1121 | Protective cap | 1413 | Disk |
| 1129 | Supporting disk | 1415 | Locking ring |
| 1130 | Bearing | 1418 | Sealing cap |
| 1131 | Shim | 1420 | Vent filter |

Image 11-5 Bevel gearbox K, sizes 39 - 189

SIEMENS



SIMOGEAR

Adapter for gearbox

BA 2039

Operating instructions

Edition

04/2016

Answers for industry.

3.3 Thread sizes and tightening torques for fastening bolts

The general tolerance for the tightening torque is 10 %. The tightening torque is based on a friction coefficient of $\mu = 0.14$.

Table 3- 1 Tightening torques for fastening bolts

| Thread size | Tightening torque for strength class | | |
|-------------|--------------------------------------|-------|-------|
| | 8.8 | 10.9 | 12.9 |
| | [Nm] | [Nm] | [Nm] |
| M4 | 3 | 4 | 5 |
| M5 | 6 | 9 | 10 |
| M6 | 10 | 15 | 18 |
| M8 | 25 | 35 | 41 |
| M10 | 50 | 70 | 85 |
| M12 | 90 | 120 | 145 |
| M16 | 210 | 295 | 355 |
| M20 | 450 | 580 | 690 |
| M24 | 750 | 1 000 | 1 200 |
| M30 | 1 500 | 2 000 | 2 400 |
| M36 | 2 500 | 3 600 | 4 200 |

3.4 Mounting an input or output element on the gearbox shaft

 **WARNING**

Risk of burns caused by hot parts

Do not touch the gearbox without protection.

NOTICE

Damage to shaft sealing rings caused by solvent

Avoid any contact of solvent or benzine with the shaft sealing rings.

NOTICE

Damage to shaft sealing rings caused by heating

Use thermal shields to protect shaft sealing rings from heating above 100 °C due to radiant heat.

3.5.2 Mount the standard motor to the K4 or K5 short adapter



ATEX version gearboxes

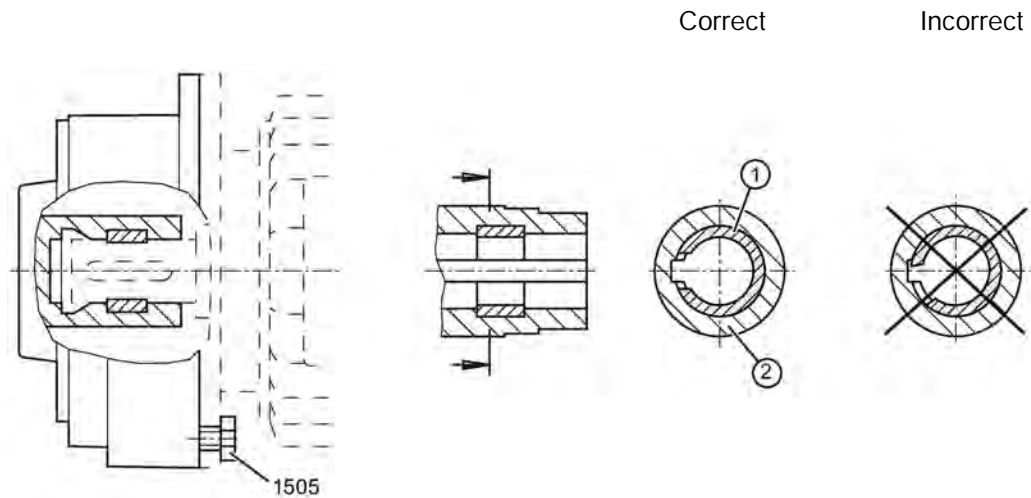
Impacts can cause sparks.

Apply adhesive (medium strength, e.g. Loctite 243) to the bolts 1505.

Note

Ensure that the plastic ring ① is located in the correct position.

The plastic ring ① prevents fretting rust. It does not need to be greased.



- ① Plastic ring
- ② Shaft
- 1505 Bolt

Image 3-4 Plastic ring for K4 and K5

Procedure

1. Check the correct position of the plastic ring ① in the shaft. Correct the position if required.
2. Align the position of the motor shaft so that you can insert it in the shaft ②. The shafts do not need to be greased.
3. Apply adhesive (medium strength, e.g. Loctite 243) to the bolts 1505.
4. Fasten the motor with the bolts 1505 with the prescribed torque. See Thread sizes and tightening torques for fastening bolts (Page 17).

You have mounted the standard motor on the K4 or K5 adapter.

Table 3- 4 Adapter K4

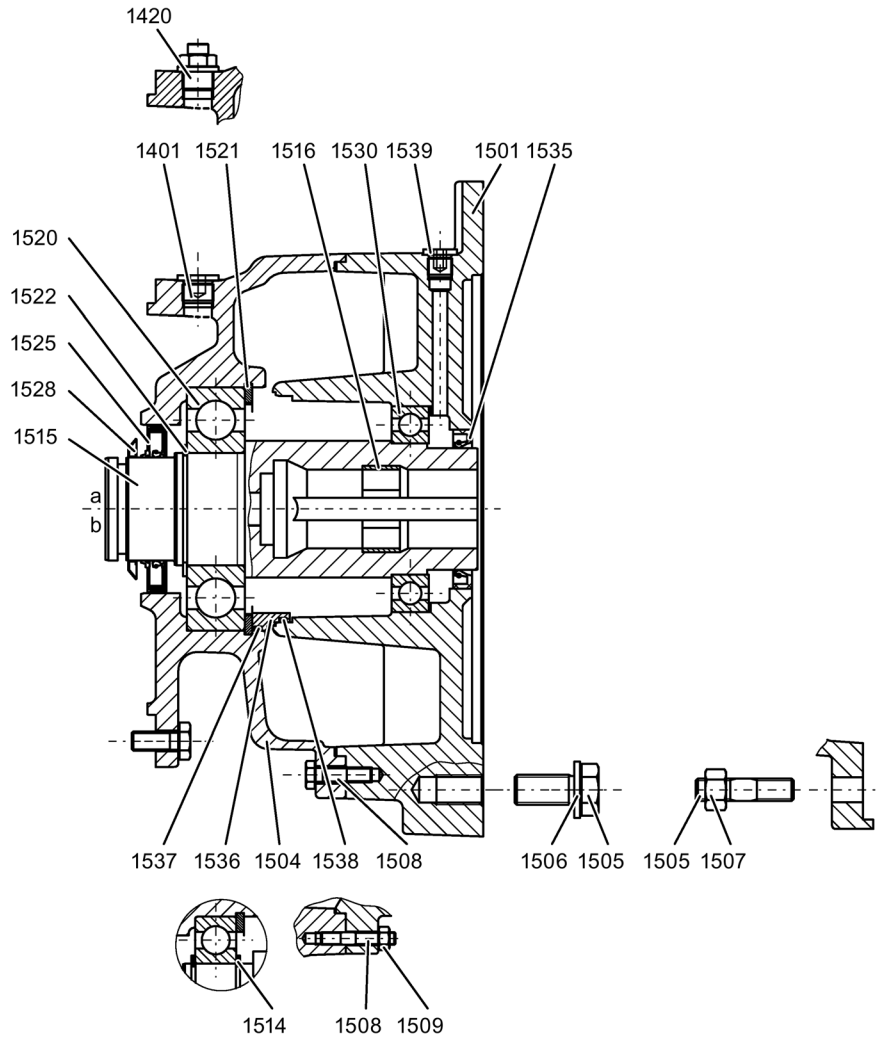
| Coupling size | 63 | 71 | 80 | 90 | 100 | 112 | 132 | 160 | 180 | 200 | 225 | 250 |
|---------------|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Bolt 1505 | M8 | M8 | M10 | M10 | M12 | M12 | M12 | M16 | M16 | M16 | M16 | M16 |

Table 3- 5 Adapter K5



| Coupling size | 56 | 140 | 180 | 210 | 250 | 280 | 320 | 360 |
|------------------------------|------|------|------|------|------|------|------|------|
| Bolt 1505 | 3/8" | 3/8" | 1/2" | 1/2" | 1/2" | 1/2" | 5/8" | 5/8" |
| T _A for 1505 [Nm] | 31 | 31 | 75 | 75 | 75 | 75 | 150 | 150 |

6.2.2 K4 and K5 short adapters with plug-in connection



- | | | | |
|------|----------------------|------|--------------------|
| 1401 | Screw plug | 1520 | Bearing |
| 1420 | Vent filter | 1521 | Locking ring |
| 1501 | Adapter | 1522 | Locking ring |
| 1504 | Bearing shield | 1525 | Shaft sealing ring |
| 1505 | Bolt | 1528 | Disk |
| 1506 | Plate / locking ring | 1530 | Bearing |
| 1507 | Nut | 1535 | Shaft sealing ring |
| 1508 | Bolt | 1536 | Intermediate ring |
| 1509 | Nut | 1537 | O-ring |
| 1514 | Locking ring | 1538 | O-ring |
| 1515 | Shaft | 1539 | Screw plug |
| 1516 | Bush | | |

Image 6-4 K4 and K5 short adapters with clamp connection

Vulcan Shaftless Screw Conveyor

Section 7

Specifications & Installation Drawings

**For General Arrangement
drawing please refer to
Section 8: Project Data, 8.3
of your VMR O & M manual.**

Job Location: Wichita, KS
Job No. 19177

SHAFTLESS SCREW CONVEYOR SYSTEM
MODEL # TF-240

1.00 DESIGN REQUIREMENTS

| | |
|---------------------|--|
| Number of Units: | Two (2) |
| Conveying Capacity: | 70 cubic ft./hr. (Conveyor Capacity at 25% trough loading) |
| Net Weight: | 2,300 lb. |

2.01 GENERAL

- A. The screw conveyor shall be provided to convey screenings material received from a mechanical bar screen. Screenings material shall enter the inlet hopper and be transported by the rotating screw to the point of discharge. The screw conveyor shall be designed to convey screenings from the drive end of the unit to the discharge end. Designs that pull the screenings towards the drive end shall not be acceptable.

2.02 INLET HOPPER

- A. The inlet hopper shall be designed to direct wet screenings material into the screw housing from the mechanical bar screen. The inlet zone will be completely shrouded to contain the screenings. The inlet hopper shall be 12-gauge thick minimum and be constructed of 316 stainless steel. All attachment hardware shall be of 316 stainless steel.

2.03 SCREW HOUSING

- A. The screw housing shall be a U-shaped trough constructed of 10-gauge thick 316 stainless steel. The interior of the housing shall incorporate a nominal 3/8-inch thick UHMW replaceable liner to prevent metal-to-metal contact between the screw housing and the

screw. The entire housing shall be supported by 316 stainless steel legs.

- B. The transport area of the screw housing shall be furnished with removable cover panels. The cover panels shall have a minimum thickness of 20-gauge and be constructed of 316 stainless steel.

2.04 SHAFTLESS SCREW

- A. The conveyor screw shall be of the shaftless spiral design and shall be connected to the drive unit and a sealing system shall be provided to prevent water from entering the drive unit.
- B. The spiral shall be formed from continuous solid bar stock with a minimum nominal thickness of 3/4-inches and nominal outside diameter of 9 1/2-inches. A 2-inch minimum diameter drive shaft shall be attached to the screw and shall be direct coupled to the gear reducer.
- C. The screw shall be constructed of high strength carbon steel and have a minimum Brinell hardness of 200.

2.05 DRIVE ASSEMBLY

- A. The shaftless screw conveyor shall be complete with an integrated drive assembly consisting of a Class 1, Division 1, Group D, explosion-proof electric motor close-coupled to a parallel shaft helical bevel double reduction gear reducer.
- B. The motor shall be 2.0 horsepower, 230/460 volt, 3 phase, 60 Hertz with a service factor of 1.15. The motor(s) shall be rated at 50°C ambient with Class F insulation and shall have a Class B temperature rise at full load. The nominal motor speed shall be 1800 rpm.
- C. The gear reducer shall be a right-angle helical bevel gear reducer. Gear reducer specifications shall be as shown in section 3.
- D. Gear reducers shall have ball or roller bearings throughout with all moving parts immersed in oil. Gears shall be of alloy steel with threads precision ground and polished after casehardening. Shafts shall be of high strength alloy steel ground to required tolerances. All ball or roller bearings shall be rated and manufactured by a member of the Antifriction Bearing Manufacturer's Association. At least one bearing on each shaft shall be of the combined radial and thrust type.

2.06 CONTROLS & ELECTRICAL SAFETY EQUIPMENT

A. Controls shall be supplied as shown in section 5.

2.07 FASTENERS

A. All fasteners and anchor bolts shall be 316 stainless steel unless otherwise indicated in this specification. Anchor bolts shall be provided for mounting the shaftless screw conveyor. All threaded fasteners shall be coated with a nickel based anti-seize thread lubricant prior to assembly.

2.08 LUBRICATION

A. The manufacturer shall state in the operating manual the amount of and specification for any lubricant required.

2.09 PROTECTIVE COATINGS

A. Stainless steel and plastic components shall not be painted. The stainless steel structural components and enclosure panels shall be bead blasted and passivated as required after fabrication to remove embedded iron, surface rust and weld burn. All other surfaces shall be blast cleaned to an SSPC-SP6 finish, removing all dirt, rust, scale and foreign materials.

B. Cleaned surfaces shall be shop primed with one (1) coat of TNE MEC 69-1212 primer, or equal, to attain a minimum dry film thickness of 2.5 mils. The motor and gearbox shall have one coat, 2.5 mils DFT, Tnemec series N69 primer and two coats, 5 mils DFT, Tnemec series 1074 topcoat. The top coat shall be red in color and semi-gloss in finish.

2.10 SPARE PARTS

A. The Manufacturer shall furnish the following spare parts for each conveyor.

1. One (1) set of replacement fuses (1 of each type and size used)
2. One (1) complete set of trough liners

All spare parts shall be properly packed in a white wooden box, labeled and stored where directed by the Owner or Engineer.

3.01 TESTING

- A. The shaftless screw conveyor shall be factory assembled and factory run tested for a minimum of 8-hours in the United States prior to shipment. The main control panel shall also be factory tested.
- B. The screw conveyor shall also be field tested after erection in the presence of the Owner and Engineer to confirm and verify the structural and mechanical compliance to the specification. The field acceptance test shall include demonstrating that the screw conveyor operates without vibration, jamming or overheating and perform its specified function satisfactorily.

3.02 INITIAL START-UP AND TRAINING

- A. The Contractor shall provide the services of a factory-employed service technician who shall adequately inspect the installation, test the equipment furnished under this Contract and instruct the Owner's operating personnel in its maintenance and operation. Manufacturer's sales representatives are not considered acceptable service technicians. The services of the technician shall be provided as follows:
- B. Two (2) trips and three (3) 8-hour days of service to inspect and certify the installation prior to startup and provide Owner's personnel in proper operation and maintenance of the equipment. Start-up service will be combined with the start-up service for the bar screen and washing press.

Vulcan Shaftless Screw Conveyor

Section 8

Electrical Control & Schematics

**Refer to Section7:
Electric Controls &
Schematics of your
VMR O & M manual.**